Serious Kitchen Play

Recipes Included

THE HOWS AND WHYS OF FOOD AND COOKING

George Erdosh, Ph.D.

2000

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Photographs by the author
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ABOUT THE AUTHOR

The author's formal science training began at the University of Western Ontario in London, Ontario where he received a Bachelor's of Science degree in Geology in 1961. He continued his university education at McGill University in Montreal where he was awarded a Ph.D. in geology in 1969.

Erdosh taught geology at university level for a few years, then continued as a mineral exploration geologist, traveling throughout the world, until mid-1980s when he switched career into the wonderful world of food sciences. He ran a catering business in Colorado and later in northern California until he began writing food-related books.

He lives with his wife in Northern California, in the foothills of the Sierra Nevada Mountains.

Erdosh's published books are:

- ***The African American Kitchen—Food for Body and Soul.*** Reference/text book for grades 7 to 12, The Rosen Publishing Group, 1999
- ***Cooking Throughout American Histories***, series of six reference/text books for elementary school children, The Rosen Publishing Group, 1997:
  - ***Food and Recipes of the Pilgrims***
  - ***Food and Recipes of the Revolutionary War***
  - ***Food and Recipes of the Western Expansion***
  - ***Food and Recipes of the Thirteen Colonies***
  - ***Food and Recipes of the Civil War***
  - ***Food and Recipes of the Native Americans***
- ***Start and Run a Profitable Catering Business***. Self-Counsel Press: North Vancouver, British Columbia, 1994

eBook: ***Science in the Kitchen—Food, Cooking and Science for Kids***, edible science experiments for kids from grades 7 to 12, 1999

Cooking is like love.
It should be entered into
with abandon or not at all.
Harriet Van Horne

INTRODUCTION

Play or Chore?

Is it a play or is it a chore? The art and science of cooking and baking may be either. If your kitchen work is a play, you'll get years of fun reading this book and decades of references that you'll keep checking and rechecking (and may be revising). If you are into other things, and cooking for you is a genuine, certified chore, this book will help ease the pain, make the chore efficient and quick, and the results more likely to be beyond just edible. In fact, you may even become addicted and become one of the players.

This book is the result of many years of research into the immense culinary disciplines, written for both the professional and the home cook. It is also the result of numerous kitchen tests and experiments. The ancient art of cooking is still filled with many kitchen myths without foundation—myths that have been propagated from generation to generation. Some have scientific bases and are perfectly valid. Others are also valid but food scientists still don't know why. There are kitchen myths without rhyme or reason, and only testing and re-testing in the kitchen proves or invalidates them.

There are other myths that are new propagated by current fashionable chefs, cooks and food writers, either through ignorance or snobbery. For example, many culinary professionals state that imported pure durum wheat Italian pastas are far better than even the best domestic pastas. Kitchen tests showed otherwise. Besides, Italian pasta makers import most of their durum wheat from the wheat-growing regions of Canada and the United States, and their pasta-making techniques are not superior to our own. So why would their pasta be better?

Focus on simple, common-sense cooking

Most new cookbooks today focus on new styles of cooking—trendy and unusual ingredients are “in”, with exotic-sounding recipe titles and catchy phrases such as "nap the plate with the sauce", "transporting the flavor", "mildly sweet to assertively spicy" and "intensify and magnify the flavors".

In this book I prefer the basic approach to everyday cooking. The focus is how to produce simple yet best-tasting foods with least effort, most efficiency, shortest time and with available fresh ingredients. Exotic, hard-to-find food items rarely make a food better. In fact, they are often of inferior quality because their slower turnover in the market. For instance, pine nuts are authentic ingredient in an Italian pesto, but fresh pine nuts are not often available and they are

pricey. Can you substitute walnuts? You bet. They are likely to be much fresher and half the price. Can you tell the difference in flavor? Maybe if you have highly developed taste buds. But your pesto with fresh walnut still beats an authentic version that uses stale or, heaven forbid, rancid pine nuts.

One of the greatest of French chefs and authorities on French cooking Auguste Escoffier (1847-1935) said "The greatest dishes are very simple dishes". In more recent years (1995) the editor of Cook's Illustrated magazine, Christopher Kimball stated "At the heart of all good, populist cooking is economy, forthrightness, and a good measure of common sense". That's common-sense cooking. His common-sense cooking encompasses the use of fresh, seasonal, available ingredients and "economy of technique". These two concepts from two different era, simple cooking and common-sense cooking are the essence of this book.

Two examples illustrate the type of cooking I urge you to avoid. Shortly before a Thanksgiving holiday a radio host interviewed a chef about baking turkey when you are in time crunch. The chef declared that you can cook a fair-sized turkey in two hours. She recommended to roast the turkey in a 500°F (260°C) oven and guaranteed it will be done in time. However, roasting at such high temperature you are not likely to get more than just barely edible meat—you may be better off to buy a full Thanksgiving dinner from a supermarket. Even if you can eat the turkey, think about your oven! At such high oven setting the turkey fat will spatter for two hours. By the end of the period the grease will burn on every square inch of the oven walls, the house will be in a cloud of smoke (you had by now disconnected all smoke alarms), the burning grease smell will stay in the carpets and curtains for weeks. And cleaning that oven will take several hours and plenty of elbow grease.

I am also against unnecessary and unjustified recipe complication, and I illustrate this with a second example. A French brioche recipe, claimed to be authentic, appeared in a popular food magazine (1998). I tried it right away since I love a good brioche. I found the recipe very involved and difficult, and its preparation would be a true misery if you are not yet a master of yeast dough. My own similar, more updated recipe (with much less butter) uses a far simpler technique. Are the results different? Maybe very slightly but, again, you need a highly educated palate to tell the two apart in a blind testing.

Lean cuisine

"Never trust a lean cook" is a popular way of expressing misgivings about the food a lean cook prepares. How much a cook eats, exercises, watches his or her diet has nothing to do with cooking ability. But the opposite is more often true. A fat cook is likely to use rich, fattening ingredients. Take a look at the jacket photo of a cookbook author then figure out the fat and cholesterol count per serving of most recipes. Is there a correlation between rich foods and overweight cooks?

This book is definitely not a low-fat, low-sugar diet cookbook. But fats, sugars, salt and cholesterol in most recipes are as low as you can go without sacrificing flavor. Virtually all recipes and ideas I present you promote healthy, nutritious food and eating, and portions I suggest are moderate in size for a person of average weight.

According to a survey by the International Obesity Task Force in late 1990s, fully 35 percent of Americans are considered obese, that is also becoming true throughout the Western world and this number is growing every year along with the waistlines. (For comparison, 15 to 20 percent of Europeans are obese, but as high as 50 percent in Eastern Europe. Scandinavians

and Dutch are the leanest.)

Get into kitchen play

Cooking and baking is not only requisite to good eating but also very therapeutic, soothing, satisfying, relaxing. It is like producing art over and over again that you consume in minutes. Then you’re ready to start again with gusto. Get into it with both feet without fear, like children do, who have no preconceived ideas of what's difficult and what's easy in the kitchen. Everything is new to them. When you encourage beginner adult cooks to prepare a yeast bread, they get panicky because yeast breads are supposedly difficult. Children don't have that idea. To them, yeast breads are just as new as preparing a cup of hot chocolate, and they are not the least afraid of either. Be a child in your kitchen, attack absolutely anything, easy or not. Go ahead and play with your food.

All things require skill but an appetite.
Collection of proverb
George Herbert, 1593-1633

INTRODUCTION TO REPAST—SALADS AND SOUPS

The aromas drifting from the kitchen are intoxicating. Appetites are honed to the sharpness of a thin-bladed carving knife. The guests consumed the hors d'oeuvres some time ago that did their job—they teased appetites. Everyone is eager, and thinks about nothing but food, like those poor souls in their 24th hour of a full-day fast. There are anxious and hopeful glances toward the table, waiting with famished anticipation for the first delightful course of the meal to arrive.

The first course of American meals, as in many other parts of Western culture, is often a salad or a soup. More formal meals include both. Whatever your first course is, it must not disappoint your diners. It should be a choice course that sets the tone for the meal. It may be small and light but it must sparkle both visually and in flavor.

In spite of the mixed heritage and range of eating habits of Americans, salads and soups are still daily affair on most of our dinner tables. Soups are universal to every cuisine in the world, but dressed raw-vegetable salads are mainly French and English. The rest of Europe prefers their vegetables either cooked, marinated or pickled. Asians, Africans and most Latin Americans don't eat salads as we know them. Yet salads are so splendid and easy to prepare, that most of our immigrants readily adopt them to include with their ethnic menus.

This American love affair with salads and soups, unlike other food addictions rampant today, is a fortunate development—these foods, besides satisfying, are healthy and nutritious. For many, they are the major source of daily nutrients. Supermarkets allot abundant shelf space to prepared canned, frozen and dehydrated soups and mixes, as well as salad dressings, and the produce section is full of fixings for salads. Let's explore salads and soups and find out how to make them the best-tasting with ease and least effort.

SALADS

We inherited salad from the French. It all began with tender greens topped with a light dressing of oil and vinegar. This basic theme got more and more elaborate, first with the addition of other raw and cooked vegetables, then fish, poultry, meats and cheeses. Today anything can, and does, go into a salad bowl. The dressings on the salad also became intricate with spices and herbs, condiments, exotic oils and vinegars. Now you hardly, if ever, see a simple salad recipe in a new cookbook or in a fashionable restaurant, yet simple salads and dressings have much to recommend even for festive meals. If I experiment with salads, I prefer the exotic ingredients in the main body but leave the dressing simple.

> **TASTINGS Salad's ancestor**
> It was the Romans some 2000 years ago who first introduced salads as they served tender greens with oil, vinegar and salt. These first salads remained simple and basic—no exotic ingredients, just the basic goodness of fresh greens with tasty oil and vinegar.

Cuisines in warm climates avoid the raw-green salads that is common on tables of cooler climates. The tender, high-moisture greens are cool climate vegetables, that neither grow well nor hold fresh for very long in warm climates. Also in tropical and subtropical climates, raw fruits and vegetables are often not safe to eat due to less hygienic growing conditions, contaminated irrigation and rinsing water and faster growth of microorganisms.

In hot climates cooks prepare salads that use cooked or marinated ingredients and, less frequently, raw but peeled vegetables. For example, Indonesian gado-gado salad includes scalded cabbage, water spinach, (a local green-leaf plant), cooked potatoes, blanched green beans and stir-fried bean curd. All ingredients are combined with a cooked peanut dressing. Every ingredients is safe from contamination. Gado-gado is not what we traditionally call salad, but is served cold as a salad, and is perfectly safe to eat, even by weak-stomached Americans from the U.S. Midwest. And it is hearty enough to be a meal in itself.

The ingredient of another hot climate example, Middle-Eastern tabouli salad, is cooked bulgur wheat (cracked wheat grains) with a type of dressing that is very close to French vinaigrette. The acidity of the vinaigrette dressing creates a hostile environment to potential contamination. The only raw parts of this salad, parsley and mint, are ingredients in small quantities, not in amounts like lettuce and tomato in our salads. Even if the parsley and mint are not perfectly safe, the amount you eat is so minute that it is not likely to harm you.

By normal definition a salad contains tossed greens or fruits. These ingredients are by far the easiest to prepare. Just cut up several kinds of fresh produce in any ratio, mix, apply prepared dressing and serve. It is hard to imagine a course easier to make, looks as nice and is so full of nutrition than one of these tossed salads. No wonder they are served so often.

There is only one problem with these traditional salads. Served often, they tend to get monotonous to a discriminating eater.

What makes a salad a salad?

Salads consist of two parts. The body that can be any basic food, cooked or raw and the dressing (the fashionable term is sauce). The dressing is either applied just before serving or, if it is to marinate the ingredients, hours before. When you dress the salad just before serving, the dressing is meant to provide flavor and mouthfeel to the otherwise mild crunchy vegetables.

If the dressing is a marinade, it can take several hours or several days to alter the flavors, textures and consistency of the foods that make up the salad.

Ordinary tossed green lettuce salads are considered passé in today's food circles and better restaurants. The trend is to mix unusual combinations or exotic, wild, even unheard-of ingredients. The new rule is, if no deaths have been directly attributed to a plant material and it looks out of the ordinary, add it to the salad bowl. Anything edible, from tiny flowers to furry twigs, flavorful to bland, bitter to sweet, has been, or at this very moment is being tried. Vivid colors, curly shapes and wispy, twisted textures are all in demand.

Some of the more established nouvelle cuisine ingredients include dried tomato, radicchio, chicory, fiddlehead ferns, all kinds of sprouts, arugula, mâche, dandelion, endive, sorrel, baby vegetables and baby greens, flowers and herbs.

Combined with the basic salad fixings, these ingredients create beautiful and appetizing plates with minimal additional work for the cook. But how to find them and how much they are going to set you back at the checkout counter is another problem. They are certainly not for the everyday meal.

Different Purpose—Different Ingredients

The use for salads today actually goes far beyond the first course. We can break down today's salads into four general types.

- **Appetizer salads**—this is a light first course designed to stimulate the appetite. The body of this type of salad is greens in combination with other vegetables or fruit. The dressing is also light and tart.

A standard green salad with a light vinaigrette dressing is typical for this use. A fruit salad of tart fruits and a light, barely sweetened dressing is also appetite-stimulating. You may add a little seafood, since it isn't filling in small doses. Nuts and cheese are heavier and you should use them in small amounts. If you're disappointed in how your entrée turned out or there isn't enough to go around in generous servings, add more calorie-rich food to your appetizer salad to partially gratify, instead of just stimulate, the guests' appetites.

You may also use a light salad as cleansing the palate, an old French tradition. In this case instead of a first course, offer it between two contrasting courses. The salad dressing literally cleanses the taste buds to prepare them for the next movement in your symphony of the meal. In this role, a salad should be especially light, usually nothing more than greens with a touch of dressing and a hint of pepper, and in minuscule portions to satisfy but a small bird's meal.

- **Accompaniment salads**—these can be heartier than appetizer salads since they accompany the main dish and complement its flavor as well as satisfy appetites.

Marinated vegetables may also accompany the entrée and complement it. They go very well with a heavy, somewhat fatty meal. A sour marinade aids the digestion of oil and butter-rich foods. Remember how your stomach craves for pickle or sauerkraut to go with hamburger or a Rueben sandwich?

A fruit compote is also a good example of an accompaniment salad. It goes well with poultry or pork. Gelatin and aspic salads, although much less popular today than they used to be, are perfect examples of accompaniment salads. With the generous amount of sugar and marshmallow that were so common in the 1950s and 1960s, they could do double duty on the menu—as salad and as dessert. But it is not fair to serve it as two different courses on the same meal. Some might notice it.

- **Main dish salads**—these hearty salads can, and often do, take the place of the entrée. Main dish salads can include anything edible. Start off with simple tossed greens and just keep adding things. You traditionally serve these salads cold, but for improved flavor, serve them at room temperature. Some you may even serve warm. Many bean salads, for example, are best when served warm.
- **Dessert salads**—usually of sweet fruits or a mixture of sweet and tart fruits. Some cooks like to add gelatin for a firmer consistency. Sweetened whipped cream or toasted nuts are winning toppings. The expected presentation of dessert salads is chilled, even frozen, but their flavor is far improved if you allow them to warm up to room temperature.

The dressing

Salad dressings are usually mixtures of an oil and a sour liquid, either vinegar or citrus juice. The ratio of the two varies, depending on the cuisine and local and personal preference. The traditional French ratio is four or five parts oil to one part vinegar. If you intend to use the dressing as a marinade, the ratio is closer to one-to-one—much higher in acid since it is the acid that works in the role of marinade.

Oil and vinegar don't intermingle with simple stirring like water and scotch do. When you add vinegar to oil, the heavier vinegar sinks to the bottom and forms an individual layer, resting snugly below the layer of lighter oil. When you shake the closed container vigorously, the oil

breaks up into tiny, invisible droplets that disperse through the acidic liquid. The liquid turns cloudy because the oil droplets no longer let the light through freely. You've just created an emulsion, though this is only a temporary state. If you let the mixture sit for a few minutes, the oil and vinegar separate again.

You can make the emulsion semi-permanent if you add a substance to slows the separation, or you can make it permanent if you add an emulsifying agent that prevents separation altogether. The simple French vinaigrette is a temporary emulsion. Add some dry mustard and it becomes semi-permanent. Mayonnaise is a good example of a permanent emulsion. The mixed ingredients in mayonnaise don't separate out, no matter how long they sit. Egg yolks contain emulsifying agents that prevent separation. Some chemicals are also emulsifying agents that food processors add to bottled salad dressings and other similar mixes to prevent separation.

These were all examples of cold dressings. Cooked dressings thicken with heat. They often also include eggs, and once cooked, they are permanently mixed. (These may not be emulsions as chemists define the term.)

Oils

Salad oils range from simple, inexpensive, flavorless vegetable oils to slightly more costly, more flavored olive oil, to more exotic peanut and sesame oils, extra virgin olive oil and highly flavored and pricey almond, grape seed, walnut or hazelnut oils. Processors can make oil from any grain, seed and nut if there are enough people to pay for them. You can jazz up any oil yourself by infusing it with any aromatic herb or spice, and change basic vegetable oil to, say, chili oil, thyme oil, fenugreek oil or cinnamon oil.

The acid part

Vinegars also range from the standard distilled white through the slightly more flavored white or red wine and champagne varieties to malt and cider vinegars. The more exotic vinegars, popular now because of their tastes and unique qualities, are mellow balsamic, fruit or herb-infused vinegars, then rice and sherry vinegars.

Vinegars range from 4 to 12 percent acidity. Ordinary white distilled vinegar is the most acidic, wine vinegars are milder and a few vinegars like rice and balsamic vinegars are the mildest. But the acidity depends on the processing and how much they dilute them before bottling, more than what the vinegar is made from. Today balsamic vinegars are in style, tomorrow something else may be in the limelight. Balsamic vinegars are high-priced, and they are aged for several years like good wines. The longer they are aged, the higher their price. Some people are willing to pay the high price but their flavor is not for everyone. Many cooks are just as happy to leave them on the shelf and pick a less exotic but good wine vinegar for their salads. Nevertheless, several kinds of vinegar on your own shelf indicate a well-stocked kitchen.

It is the acetic acid in vinegar that gives the sour taste. To make vinegar, the processor starts with a grain that yeast can ferment, converting the grain's sugar into alcohol. Then bacteria converts the alcohol into acetic acid and the processor dilutes the final product with water to the desired acidity. Besides acetic acid, vinegars contain other organic acids and a group of organic chemicals called esters which contribute to the flavor and aroma.

You can make your own vinegar from wine but you need to add a mother, which has the

bacteria to convert alcohol into acid. The bacteria may be in the air around you or, to be sure, you can purchase a starting culture mother (wine-supply houses often carry them).

You can also make your own fruit and herb-infused vinegar quite easily. For a berry vinegar, add 2 cups of fruit to 4 cups of wine vinegar, bring to a simmer, then cool. Let the mixture stand for at least 3 or 4 weeks in a capped bottle before using. To make an herb vinegar, start with 1 cup of fresh herbs to 4 cups of wine vinegar. Bruise the herb leaves slightly so they release their aromatic oils better and add them to the vinegar. You may use spices instead of herbs in the ratio of a ½ cup spice to 4 cups of vinegar. Crush the seeds a little for more intense flavor. Add warmed vinegar to either herbs or spices, and let it steep for 3 to 4 weeks before using, again in a capped bottle on your pantry shelf.

Instead of vinegar, lemon juice may provide the salad's acidity. Freshly squeezed lemons or limes (or frozen from freshly squeezed that you keep in your freezer) add a unique flavor of their own. Commercially available juices are not so good unless you don't mind their chemical twang.

If you use lemon or lime juice to replace vinegar, use it one for one in volume. Mixing lemon juice and vinegar is not against the law that results in an interesting, pleasing flavor.

Italian herb dressing

Ingredients

3 ounces (90 ml) virgin olive oil
3 ounces (90 ml) salad oil
½ cup wine vinegar (red or white)
1/3 teaspoon Worcestershire sauce
1½ teaspoons sugar
1½ teaspoons salt
1 teaspoon black pepper
1 tablespoon dry basil leaves, crushed
1 teaspoon dry oregano leaves, crushed
1 teaspoon dry tarragon leaves, crushed
2 cloves garlic, finely minced

Procedure

1. Put all ingredients into a one-quart jar with a tight-fitting lid.
2. Shake, shake, shake until the salt and sugar are dissolved and the dressing is uniform, thin, sauce-like in appearance. Refrigerate. Shake again before using.

Makes 14 ounces (415 ml) of dressing.

Prepared dressings

There are scores of commercial salad dressings available. Some of these are even good. But they are meant for cooks who don't realize how easy it is to make their own, no matter how little time they have.

If you're really short of time, a simple vinaigrette dressing, consisting of 3 or 4 parts of good oil, 1 part wine vinegar, and a little salt and pepper, is perfectly appropriate for many salads. If you have the time to be a little more creative, add herbs or spices, tomato paste or mustard before whipping all into an emulsion with a wire whip or simply shaking the ingredients in a tightly-capped bottle to form a temporary emulsion.

More than one way to dress up a salad

Salads offer more room for creativity than any other course in the meal. Haul out the salad bowl and your fingers itch to pluck flowers from the bouquet on the table, pinch leaves from anything growing on the window sill or in the yard, sprinkle seeds, nuts, dried fruits and other tidbits from various containers in the cupboard. It is also the course most likely to please every palate unless, of course, you went overboard in the wild and exotic ingredients department.

Even if you've planned a simple tossed salad, select your ingredients for contrasting colors, textures and shapes. Pay attention to flavor as well as color. You can chop and mix the ingredients hours before dinner. Salad keeps well in the refrigerator as long as you don't add the dressing. For more speed in serving, put the dressing in the bottom of the bowl, add the salad ingredients without tossing and refrigerate. An ingenious cook puts serving spoons in the bowl over the dressing before adding the greens to keep them separate. Then at serving time she tosses, ready to serve. Takes less than a minute.

With just a little more work, you can create a composed salad from the same ingredients. Composed salads are much favored by white tablecloth restaurants and higher quality caterers because they offer great presentation with little extra cost and relatively little additional work. The disadvantage of composed salads is that you cannot build them too far in advance of serving, partly because the ingredients must look their very best, but also because they are served individually, and that takes a lot of refrigerator space if stored. These salads require more planning and time than tossed salads.

Concentrate on simplicity, creativity and inspiration when building a composed salad. You can create a stunning visual art work without being either a professional chef or an artist. If you have artistic inclinations, you will enjoy the job thoroughly and find it a reasonably easy task. If you don't, you will still like putting the ingredients together though the product may not be a saleable art work.

You plan a composed salad in two stages. First, decide at the kitchen table with a pencil and paper what ingredients you would like to use, keeping availability and seasonal aspects in mind. Then, with your shopping list in hand, go to the market. Substitute your originally planned ingredients according to what is available in the produce section, what looks freshest and what is still within your budget. When substituting, keep in mind your objective of flavor balance, contrasting textures, colors and shapes.

Vegetables and fruits out of season may look good, but their flavor is usually minimal and their cost extravagant. (Just look at the so-called "vine-ripe" tomatoes in January.) In your initial planning stage, think in terms of seasonal items that are not usual salad ingredients, or that you can prepare in an unusual way, either by the cooking method or how you cut them up. For instance, when cooks add eggs to salads, they usually hard-boil them, then they slice them or cut into wedges. Why not make a plain omelet instead, sliver it into thin strips, then add the strips to your salad? Another example is peeled broccoli stems cut into thin rounds, match sticks, ovals or tiny cubes for varied shapes. You can come up with dozens of others ideas.

Besides the accustomed salad vegetables, you can use any other produce, including just about any fruit. After cutting fruits that brown when exposed to air, immerse them in an acid bath for a minute (see under Desserts). Small amounts of pickled or marinated vegetables are other great additions. Cheeses, fresh-toasted nuts, cooked fish, meat, poultry, processed meats or eggs in tiny amounts give even more flavor and color varieties.

Edible flowers are great for visual impact. Don't use flowers from your garden if you sprayed them within a few weeks or commercially-grown flowers that may have been sprayed with chemicals to extend shelflife, unless they grew the flowers specifically for culinary use. (See list of edible flowers below.) Don't use more than a blossom or two. People are either suspicious of eating flowers, or they might feel criminal about it.

Edible Flowers

Bachelor button	Yucca
Carnation	Lilac
Chrysanthemum	Nasturtium
Dandelion	Pansy
Day lily bud	Petunia
Elderberry	Pink
Flowers of edible herbs	Portulaca
Forget-me-not	Rose
Guava flower	Squash
Hibiscus	Snapdragon
Honeysuckle	Viola
Impatiens	Violet

One precaution—avoid very strong-flavored foods that overpower the salad, like pickled herring—or ones that ruin the color scheme. Beets tend to bleed all over their neighbors if they rest together for more than 15 minutes.

Getting it together

When making the dressing, count on 1 to 2 tablespoons (0.5 to 1 ounce or 15 to 30 ml) of dressing per person for a lightly-dressed salad. Always prepare extra for those particular guests who like to drown their innocent salads greens. You may serve dressing on the side or dress the salads yourself before serving. Lots of dressing, by the way, dampens appetites thanks to its high oil content.

For an average serving, plan 3 to 4 ounces (85 to 110 g) of salad ingredients for each guest if you plan your salad to stimulate appetites. Add a little more if the rest of the meal is light. Cut up the ingredients into bite-sized pieces. The usual rough-cutting suitable for tossed green salad is not satisfactory for a composed salad. Use pleasing shapes and be meticulous. For instance, you may cut broccoli into small florets with even-length stems, carrots angle-cut into thin ovals or little match sticks, strawberries may be sliced thin, small berries can be left whole, green beans look elegant if French cut, asparagus left whole (gives the guests something to do), peppers cut into rings or narrow strips, beans and lentils left whole, and so on.

Some items you need to cook, like green beans, and any other vegetables that generally

don't taste pleasant raw. You may prefer to blanch others, like carrots to intensify flavor and color. Still others, like walnuts, are best lightly toasted to bring out flavors. Do any cooking or blanching after you cut the food up. You can do all this preparation hours ahead and then store the ingredients on a tray in the refrigerator.

When you're ready to assemble the composed salad, spread out the individual plates on a table or counter and start constructing. The job takes some concentration, and it is best done without interruption. If guests are hovering around your kitchen and you can't get rid of them, find an empty room. Even the basement will do if there is a table.

Tear the selected greens into bite-sized pieces or use whole leaves and let the guests do the struggling. Distribute them on the plates as beds of greens. With a preplanned picture in mind, arrange the rest of the ingredients on the beds. You can arrange them randomly or group same ingredients in clusters with contrasting shapes and colors next to each other. Use the color of the greens to contrast with the assembled items, for instance, the orange color of a carrot cluster is set off nicely against the deep green of spinach.

Arrange all plates according to the same pattern scheme. You can, if you prefer, build a single prototype, then arrange the rest of the salads like the mock-up. Once you have a prototype, others can help you to build the salad. For additional interest, add one ingredient that is unique on each plate and see how many guests will notice. (With deep conversation probably none will.)

Making a composed salad sounds more complicated than it really is. Try it once and you'll see for yourself. It is particularly easy when you’re entertaining 20 or 30 guests. Once you lay out the plates and chop and prepare the ingredients, you can assemble the salads in 10 minutes. Drizzling on the dressing takes another 3 or 4 minutes.

When preparing salad for this many, a quick and easy way to dispense the dressing is a drip bottle, like a plastic mustard dispenser with a small hole in the tip. Put the dressing in the dispenser well ahead of serving time. Shake it up thoroughly just before serving (to make an emulsion) and drizzle the dressing on each salad. It is very quick. Make sure you don't drown the salad in dressing. It is far better to have your salad underdressed than overdressed.

The dressing for a composed salad can be anything you wish. Vinaigrettes are best because they are transparent and don't hide your gorgeous creation.

Storing your greens

All salad greens, even when torn to pieces, are living plants. They need water and they need air. They don't do well at all in a closed plastic bag—they use up the available air, humidity in the bag builds too high, and rot and mold set in. If you don't use your greens within a day or two, here is a good way to keep them fresh and crisp even up to a week. First wash the greens thoroughly in cold water (contrary to what many cookbooks tell you) when you get home from the market. The greens soak up water they need, their cells swell with moisture and the leaves become crisp. Now remove as much of the surface water as possible, extra water that causes rotting and browning. Shake them thoroughly, use a salad spinner or soak the extra moisture up with a kitchen towel. Whatever way, try to dry them as well as you can. Next, wrap the greens in a dry kitchen towel, roll them up fairly tightly in the towel, squeeze much of the air out and place this package in a plastic bag. You will be surprised how well they keep this way in the refrigerator.

Making it an entrée

At the opposite end of a light but free-form composed salad is the hearty main-dish salad with precise ingredients and proportions. A good example is the marvelous Mediterranean Salade Niçoise in which the blend of flavors is defined by tradition. Although the recipe is not etched in stone and you can meddle with it a little to suit your taste and diet, too much modifying produces a different salad altogether. If the new version is a hit, name it after yourself. Otherwise, give it your rival cook's name.

Main-dish salads are great for light repasts. You can prepare them well ahead of the meal, some salads even days in advance. In fact, most of them don't reach full flavor until they rest and mature in their dressing or marinade, the ingredients fuse and intensify their flavors for hours or even a day, like a robust soup or stew. To make the cook's job still easier, they are often most flavorful when you serve at room temperature, so you can pre-plate them hours before the meal.

Some of these complete-meal salads are time consuming to prepare, require quite a number of ingredients and plenty of chopping. But the total time involved in their preparation is still small compared to preparing a full meal. And you needn't serve much else with them. Fresh hearty bread, hot biscuits or scones are a welcome accompaniment, possibly with some cheeses or cold cuts.

To allow for finicky eaters, prepare two or even three salads with different styles, flavors and heartiness. Since you serve them at the same time and at least some of the guests will want to try each, don't make the flavor differences so extreme that they clash. Wouldn't you hesitate to serve a Tex-Mex chili salad with an Indian curried rice salad?

Not all main-dish salads have rigid recipes. Some are sympathetic to your creative culinary urge and accept whatever you have on hand. Pasta salad is a perfect example. As long as you keep the proportion of pasta, vegetables and dressing reasonably unaltered, you are free to create. You can add any vegetable that you would add to a tossed green or composed salad.

You can even vary the pasta. In fact, why not use two or three different pastas with contrasting shapes and sizes? If they all have the same cooking time, throw them in the pot together. If the cooking times vary, add them to the boiling water at staggered times so they all end up perfectly cooked, al dente, when the timer rings.

If you haven't already added main-dish salads to your repertoire (I am not talking about macaroni, three-bean or potato salads here), try a few. They can be a lifesaver (well, maybe only a reputation-saver) when you have guests coming but your time is at a premium. You can prepare a full-meal salad the night before to mature and develop to its full flavor by the time your guests sit down at the table. Work up to half a dozen of these that you can prepare with ease and on short notice.

Oriental duck salad

The following recipe is a imposing addition to your salad recipe collection. Duck meat gives this salad a more complex, more aggressive flavor than the more subdued chicken would with a toothsome texture, since duck is more moist, more highly flavored. Substituting chicken or turkey meat for the duck, of course, is perfectly fine but expect the salad less inviting. Using skinless meat reduces the fat content considerably and some of the flavor as well as fat is always a predominant flavor carrier.

For the finest flavor, it is best to use fresh-cooked duck meat but duck left from a previous roast is nearly as good as long as it has left the oven no more than two days ago. (Poultry meat oxidizes particularly fast to develop off-flavors.)

A combination of toasted sesame oil, soy sauce and ginger give this salad the typical Oriental flavor. You cannot substitute these three ingredients but the vegetables you can as long as a balance remains in the color and textural themes.

Ingredients

1 tablespoon toasted sesame oil
1 pound (450 g) boneless skinless duck meat, pounded thin and cut into narrow strips
4 ounces (110 g) snow peas, string removed
2 medium carrots, peeled, julienned
2 medium celery, julienned
5 ounces (140 g) daikon (Chinese radish), peeled, julienned

Dressing

6 tablespoons rice vinegar
¼ cup soy sauce
1 tablespoon sugar
2 tablespoons fresh ginger, finely minced
½ teaspoon red chili flakes

Procedure

1. Combine ingredients for dressing in a large salad bowl, stir well until sugar is dissolved and ingredients are combined.

2. Stir-fry duck over high heat in sesame oil in a preheated heavy wok or large, heavy skillet for 2 minutes, stirring tirelessly. Remove duck and add to salad bowl, moistening with dressing.

3. Blanch snow peas in salted, boiling water for 30 seconds, drain and quickly chill in cold water. Drain again. Add to salad bowl with carrots, celery and daikon and stir well. Let salad marinate for 30 minutes at room temperature. Chill if you don't plan to serve it within 30 minutes.

If you don't serve the salad for several hours, don't mix the snow peas in. The vinegar in the dressing destroys the chlorophyll pigment in the snow peas within a few hours and they end up in a dingy, unappetizing brownish color. Reserve the snow peas and toss them in 15 minutes before serving to avoid this problem. If you plan to keep extra salad, use a different kind of vegetable to keep it wholesome looking. Most green vegetables end up with similar fate. You may use green or red bell peppers or sliced mushrooms instead that remain unaffected by acid.

Serves 4. Keeps for two days if refrigerated but this salad is best fresh. Serve at room temperature for most flavor.

Those exotic ingredients

Many strange-sounding names float around on lists of salad ingredients in fashionable recipe books these days. But not many of us are lucky enough to live close to a well-stocked

greengrocer or supermarket with a full array of new-age baby greens. Often even the produce manager of a large supermarket can't tell you what you are holding in your hand unless it is next to the sign that labels it.

To help ease the confusion, here is a brief list of "new" ingredients, few of which are actually new. Their availability in quantity is new, thanks to the demands of innovative chefs and today's eating trends. I have included old stand-byes, too, with alternative names. Names, by the way, vary somewhat in different part of the country.

- Iceberg or head lettuce is the most popular though the least nutritional of all the salad greens and taste rather blah, like a piece from an iceberg. When you say lettuce, most people conjure up a picture of an iceberg lettuce head. It is easy to grow, easy to store, has a long shelf life and it transports well. That makes it inexpensive, always available, crisp and crunchy. Ever discover a hidden head weeks after tucking it into the refrigerator? It may be a little brown around the edges, even slimy here and there. But the inside is perfectly crisp and usable.
- Romaine or cos lettuce has broad, stiff, upright leaves. It is the hardiest of all the lettuces and has the strongest flavor, though it is still mild. Great by itself, it is also good mixed with the more delicate salad greens as it adds a firm, extra crunchy texture and sturdiness.
- Butterhead, bibb, Boston, limestone or buttercrunch lettuces are very tender and mild buttery-flavored. They form small loose heads. The various names refer to varieties, but they are fully interchangeable in salads and are not much different in taste.
- Red leaf and green leaf lettuces don't form heads and don't keep quite as long as iceberg lettuce. They, too, have a mild flavor, although more flavorful than iceberg. They add bulk and interest to salads with their slightly wavy-structured, attractive-colored leaves.
- Spinach is popular in salads because of its vivid, dark peacock green color. It stands out and contrasts well among the more subdued colors. Raw spinach has a very mild, almost bland, flavor compared to the cooked form of this vegetable.
- The cabbage family includes a large number of mild to strong-flavored greens that you may use in small amount with other greens. White and red cabbage are the most common. Both stay fresh and crisp for a long time. Red cabbage adds a most desirable red to fuchsia color to salads, and in mid-winter it may be the only salad ingredient with a reddish color contrast that doesn't cut deep into your food budget. The several varieties of oriental vegetables in the cabbage family, like bok choy and napa cabbage, are very mild, but crisp, beautifully-textured, attractive-colored and readily available.
- Arugula, also called rocket or roquette, is a small-leaved green with spicy, tangy, unusual flavor that mixes well with any salad green. Some people find its flavor too aggressive—use it in moderation.
- Curly endive is dark green with prettily-shaped leaves and a slightly bitter flavor. This green is in the chicory family. You may substitute any chicory family member in this list for another. Remember to use them all in moderation. Some people taste the bitter flavor only slightly, but others are very sensitive to the taste (this is a genetic trait).
- Belgian endive is slightly bitter but still mild-flavored. It is also a chicory. It grows in tightly bunched cylindrical-shaped, very pretty sprouts.

- Plain endive is also a bitter chicory with lettuce-like leaves which curl at the ends.
- Radicchio also called red or Italian chicory, is bitter like other chicory family members. It forms small tight heads like miniature head lettuce. It owes its popularity particularly to its beautiful colors, red with white tinges.
- Escarole, another chicory, has broad leaves and is easily confused with curly endive. The two are very similar in their looks and flavors, but escarole has plain, lettuce-like leaves.
- Watercress is a mild-flavored green, has tiny leaves that add a small tingle with a touch of piquant to salads.

These are the greens that are frequently available in a good produce department, though they are not all in daily use in many households. The lesser-known greens tend to be more available in grocery stores in ethnic areas of a city or in supermarkets of wealthier neighborhoods. They include:

- Mâche, also called lamb's lettuce, corn salad or field salad is popular in the Mediterranean, though it grows wild in most corn or other grain fields. It is a bland green having small leaves. It adds hardly more than variety and interest to your salad.
- Nasturtium flowers and leaves are edible but rarely available in the produce section of a supermarket. They have a wonderful peppery flavor. Both the round lush-green leaves and multicolored flowers look beautiful in any salad, and your taste buds definitely perk up and notice the punch.
- Sorrel or sour grass is more a European favorite. There cooks serve it cooked as well as raw in salads. It looks like spinach with smaller, dark green leaves. This green is quite tart. Use only a few leaves in each salad. In small quantity it gives a truly jazzy, sour flavor to your blander greens.

SOUPS

There is no cuisine in the world that does not include a large array of soups. Western and Eastern cultures, African nations from primitive tribes to those with elaborate culinary repertoires and all Latin American countries have many favorite soups. But the countries with probably the largest soup repertoire and greatest popularity are those in Eastern Europe—Germany, Austria, Hungary, Poland and Russia. In Hungary, a meal is not a meal without soup and bread, just as a meal is not a meal without rice in Asia. Eastern European soups range from light to very robust. Mediterraneans favor lighter first-course, instead of main-meal, soups.

In the Orient, on the other hand, they tend to serve first-course soups more in celebrations and feasts, not in every-day meals, except for the full-meal soups in noodle shops. Oriental soups consist of a full-flavored poultry or meat broth with few added ingredients. The focus is on the full-flavored broth and anything else is merely embellishment, garnish and texture. Take, for instance, Chinese hot-sour soup. It starts with a full-bodied no-compromise meat broth to which the cook adds Chinese mushrooms, bamboo shoots, bean curds, a little pork, and even eggs. These ingredients cook in the broth for just a few minutes, so their flavors have little impact on the soup. It is the broth that provides the taste buds with a jolt of pleasure, other items add to the complexity, provide body and mouthfeel.

Most soups pack plenty of nutrition. A wisely chosen pair of soup and salad can give you the healthiest meal of the day and virtually your complete daily nutrient need. If you make your

own, you can regulate the amount of fat, total calories, cholesterol, sugar, salt or whatever your personal concern may be. If you use prepared soups, read the labels carefully. They are usually long lists that read like check-lists for chemistry experiments.

> **TASTINGS Jewish penicillin**
> They have been telling us at least since the 12th century that chicken soup cures a variety of illnesses. Now there is even medical research to verify its impact on the common cold (thanks to Dr. S. Rennard's team at the University of Nebraska Medical Center, 1993). Although the researchers couldn't identify the single substance in the soup that fights bacteria, viruses or other invaders of the body, they clearly showed that there is something in old-style chicken soup that is very beneficial. Their best guess is that it is the combination of broth, chicken and vegetables, along with TLC in the preparation, that provide the magic. Whatever it is, take time to prepare your own without shortcuts during the flu and cold season.

A soup is often the only hearty course that is acceptable to both vegetarians and meat eaters. Babies love it, and their great-grandparents do, too.

Get into soups

Soups offer many advantages to the home cook and they are particularly great for free-form cooks who scowl at recipes. First, they are most amenable to changes. If you don't have a particular ingredient, substitute. You will get a different-flavored soup, but it will still be good, provided you substitute with good kitchen sense.

When you replace an ingredient, use another of similar taste, preferably ones of the same family, in case of vegetables. It is fine to use broccoli if you can't get Brussels sprout, turnips for parsnips, or onion for shallots. But substituting beets for cabbage somehow doesn't make the same sense. Leaving an ingredient out completely because you don't have it on hand or you hate it doesn't ruin the soup, unless, of course, that ingredient is as essential as salt.

Second, soups keep extremely well. Many, if not most, soups even improve with storage as the flavors fuse, marry and intensify. This is particularly true for hearty soups made up of many ingredients—thick vegetable soups, soups made from legumes, meat and chicken. Never waste your time making enough soup for just one meal. A little more cutting up triples or quadruples the result. Most soups keep well refrigerated for days or even a week. If you don't think you will use it that soon, freeze the extra in measured portions. You can thaw a portion next month when time has gotten away from you, and a starving family is demanding dinner now.

Freezing extra soup in a heavy plastic bag is very practical. Bags not only take a minimum of freezer space but when you need a meal in a hurry, just cut the bag away from the frozen hunk of soup and drop it into the pot to reheat. Or place the plastic bag of frozen soup in a bowl and microwave it. It is almost an instant meal and far better than any prepared foods you can get in the supermarket's frozen food section.

Add a different spice or set of spices, an additional vegetable or leftover meat, fish or poultry, and your family may not even recognize it as the soup they ate not long ago. Altering texture and appearance by puréeing works well, too.

Who is who in soups

The foundation of any good soup is either broth, stock, bouillon or consommé. So what's the difference between these four? Not a great deal. They are all liquid end-products that absorb most of the flavor from the original food—meats, vegetables (or even stones if you're making stone soup). The differences in the four are strength, concentration and clarity. Here is your guide to this mysterious jargon.

- **Broth** is what you end up with when your main ingredient is meat, fish or poultry, with vegetables and spices acting only as flavorings. Broth has a full, rich flavor.
- **Bouillon**is the French term for meat broth. Beef bouillon and beef broth are the same thing.
- **Stock** is somewhat lighter, more predominantly vegetable-flavored and is made from whatever is available. Some meat or bones may be part of the solids. Stock is also very flavorful. You can serve a stock as is, adding little more than few fresh vegetables or noodles and garnish. It is also popular as a base for more complex soups, stews and sauces.
- **Consommé** is a broth that has been clarified to the transparency of tea. The idea is to develop an even more intense flavor than in broth. The demand for crystal clarity makes it hard to prepare it successfully. Here are some tricks chefs use to prevent cloudiness, and to clarify a broth once it has clouded. They are not difficult to do by home cooks though they take a little time.

1. Whisk a small amount of the hot stock into beaten egg whites. Add this mixture to the completely fat-free stock and bring slowly to a simmer, stirring occasionally to disperse the egg whites throughout. Over a few minutes' time, the egg whites collect the sediments in the stock and rise to the surface. Now you can filter the egg whites through a cheesecloth. Be careful. If the stock comes to a boil, it may cloud up again.

2. You can also add lean ground beef or broken-up egg shells to the stock, bring it to a simmer, then filter as above. The beef adds extra flavor, but the egg shells only help to clear sediments.

Serving a cupful of clear, cloudless, incredibly tasty hot liquid with nothing added provides a first course that few others can satisfy. It is a fabulous start for a formal meal, and that is exactly what consommé's place is in the meal.

- A **double consommé** has an even more intense, luxuriously rich flavor. To prepare this, cook fresh meat and vegetables in a previously prepared broth, then clarify it. This is now in the professional chef's arena.

We inherited this complex terminology from the classic French culinary art in which the distinction between a broth and a stock was important. Being a stickler to precise terminology in nouvelle cuisine is no longer as important. The huge array of classic French sauces is hardly ever used outside the milieu of French cookery, and whether you produce a stock or a broth matters little, as long as it results in a superb soup. The term broth, however, is used less today in preference to stock, whatever the base of the resulting liquid.

While we are with terminology, let's identify some other common soup terms:

- **Purées**. You pass both liquid and solid through a blender, food processor or food mill, ending up with the same flavor but an altogether different consistency and mouthfeel. If you have served the same soup twice already and still have leftovers, purée and add a fresh garnish. You created a new soup with little effort. A blender produces a very fine purée, like baby food. A food processor doesn't purée quite that fine and food mills vary depending what

type you have.

- **Cream soups**. These are purées to which you add milk, cream or a combination of both.
- **Bisque** is a cream soup in which the main ingredient is traditionally shellfish, though you can use vegetables for a bisque, too.
- **Chowder** is a thick fish or meat soup with vegetables in milk, cream or a combination of the two.

With these basic definitions you'll know what any cookbook or restaurant menu is talking about. But how you prepare your own soup base matters not at all.

Get out the stock pot

Stock is the basis of many soups. You can make a big pot of it from time to time, use some immediately and freeze the rest in small batches. That way you always have stock on hand. If you are economically-minded, accumulate stock ingredients continually in your freezer in a large, heavy plastic bag reserved for the purpose. Add any clean vegetable peelings, raw poultry bones, wings, hearts, gizzards (omit the liver—it is too strong in flavor), any unused meat parts, even the chicken skin. Don't mix meat bones with poultry bones. Store them separately for two different stocks.

Carrots, celery and onions are the three essential ingredients in a traditional stock. Anything else is optional. If you use whole vegetables for your stock, you need not peel them, just wash well. You can add onion with skin on. Just cut it into several large pieces for better exposure in the liquid. Onion skins have no flavor (chew some to test this for yourself), but they give a pleasing brownish tinge to the stock. If you like a lighter, golden yellow color of a traditional chicken soup, peel the onions.

The ratio of vegetables is not critical, but cooks typically add onion, carrot and celery in the ratio of 2:2:1. A piece of parsnip, parsley root or celeriac gives a fuller flavor. Don't be afraid to add pieces of green pepper, even a chili, parsley stems, scallion tops, smaller chunks or peelings of turnip to your freezer cache. Strong-flavored vegetables, like Brussels sprouts or cabbage overpower everything else, so find another use for them.

TASTINGS Herbs in the soup

When you use herbs in a soup, add them toward the end of the cooking time. If you add them too early, the aromatic compounds to which they owe their zest evaporate with the steam while simmering, or break down in the heat. Robust, hardy herbs like bay leaves and rosemary you can add early. The more gentle, the more delicate the herb, the later you add it.

The remaining stock ingredients are spices, herbs and, of course, salt. Add about 1 tablespoon of salt for every gallon (4 liters) of liquid for average saltiness. Change the amount to suit your cooking style. Monosodium glutamate (MSG) in the proportion of 1½ teaspoons to a gallon of liquid really brings out the vegetable flavors (for more about MSG, see Flavorings chapter). But if you use it, reduce the salt to 2½ teaspoons per gallon (4 liters).

Peppercorn is also an essential part of any good stock. Fifteen peppercorns per gallon (4 liters) gives you a mild flavor; half a teaspoon adds more zip. French bouquet garni, a mixture of thyme, bay leaf and parsley sprigs, is also traditional, but here you are on your own. You can modify or leave out herbs, depending on the end purpose of your stock, available ingredients or

your and your family's taste preferences. Two or three cloves of garlic are another option. Don't be afraid of adding too much garlic. During cooking their strong garlicky flavor mutes completely to a mild, sweet flavor note.

Just remember that a stock pot is not a waste can. If a vegetable is not good enough for any other use because it is old and tired, it won't add much to your stock either. Anything with signs of spoilage is out, too, unless you can remove the spoiled portion easily. If you are going to purchase vegetables specifically for a stock, the more mature they are, the more flavor they have. Their toughness doesn't matter—all you want is the flavor.

If you skin poultry before cooking, add the skin to your stock supplies. Poultry skins have plenty of flavor, nearly as much as the bones. A lot of fat, too, but you can easily remove that after you've chilled the stock. A chicken stock made with plenty of chicken skins is as full-flavored as a stock made with chicken bones.

For extra-flavorful stocks, sauté the vegetables in a little fat (butter, oil or a combination) before adding them to the pot. Meat bones add much more flavor to a stock if you put them in a hot oven and brown them first. The browning action creates a great number of new organic chemicals, some of which are flavor enhancers in tiny amounts (see the chapter on Flavorings for more information on this). Browning vegetables and bones does take extra time and effort, and you can produce a very good stock without this added step. Remember, too, that when you brown vegetables and bones, your stock turns into a darker shade—the more browning, the darker the stock. In the light, golden Jewish chicken soup nothing is browned.

TASTINGS What's that scum?
Many cooks suggest to remove the scum that forms on the surface of a stock during simmering. Scum only forms when you have meat and bones in the liquid. It is a mixture of coagulated protein and fat—unappetizing but not harmful. If there is a lot, it is a good idea to skim the scum off with a shallow spoon because it eventually clouds a clear stock. If you see only a little scum, you can safely forget it.

Take stock of your stock

It is a basic principle of chemistry that chemical components of a solid immersed in a liquid aim to equalize their compositions—the flavors of a liquid move into the solid and vice versa. Heat hastens that process. That's why the rich flavors of the meat and vegetables transfer to the liquid when you simmer them together for any length of time. But, as the French proverb says, "to make a good soup the pot only must smile". Boiling gives you a cloudy stock. Very gentle simmer, or as some chefs call it, subsimmer, is the key—just enough heat to see a few slow bubbles rise up to the surface.

How long a stock needs to simmer depends on what is in it. You want to extract the maximum flavor from the basic material. If it is a vegetable stock, 1½ to 2 hours should reduce the vegetables to a flavorless pulp, with their flavors transferred to the liquid. Chicken bones take longer, 3½ to 4 hours. Meat bones are the thickest and most dense. Allow 5 to 6 hours of subsimmering to get all the flavor into the liquid.

The solids in the finished stock has little flavor left. Some cooks, who refuse to throw anything out, try to reuse it anyway, particularly any chicken meat left on the bones. They use this as filler in salads, soups and casseroles, but don't expect it to add to the flavor of the dish,

only texture and bulk.

If you use bones with very little fat in your stock, defatting isn't necessary. A small amount of fat not only gives extra flavor but a pleasing appearance. But if your starting ingredients are fatty, chicken skins for instance, here are two easy ways to remove the fat after cooling:

• If you need the stock immediately, use a baster to get under the layer of fat floating on the surface, draw up bastersful of soup and release into another pot until you have as much as you need. Keep pressing the baster bulb slowly as you push the tip through the fat layer. As you force the air out, the fat cannot get in the baster while you pass the tip through the fat layer.

• If you don't need the stock right away, cool it on the stove covered until it is no longer hot, then place in the refrigerator to thoroughly chill. You can scoop the congealed fat from the surface, leaving as much behind as you wish. With this method you can create a perfectly fat-free stock.

Some cookbooks suggest other fat-removal methods, but these two are the easiest. You can also purchase an ingenious little decanter with a long spout in kitchen equipment stores designed to separate the fat on top while the long spout drains the fatless bottom portion. If you like gadgets and you have a plethora of closet space, this may be for you.

Substitutes for homemade stock

You have two choices if there is no stock left in your freezer and no raw ingredients or time to make a fresh supply—powdered dehydrated mixes or canned broth. I tested many of these to find the best-flavored and least salty ones. As expected, none comes anywhere near a home-cooked stock in flavor. Canned broths are the least flavorful, even though many of today's magazine recipes call for them as substitute for home-cooked.

While the commonly available bouillon cubes and dehydrated powders are more flavorful, they are far too salty (they use salt to preserve them). There are, however, some quite acceptable chicken and meat broth concentrates, but you need to experiment to find one in your location that you like. High-end food markets may carry good ones as well as some high-priced frozen broth concentrates (which could be a good as your own). If you find a food store that sells wholesale to the food industry (but also sells retail), you'll find containers labeled chicken base and beef base, generally in 16-ounce jars. Avoid the cheaper versions labeled chicken-flavored and beef-flavored. The higher quality bases have minimal salt and maximum flavor compared to anything else commonly available. They have enough salt to keep for years without noticeable deterioration. If you fail to find any other substitute for home-made stock, buy some dehydrated chicken and beef bouillon and reduce the salt in your recipe.

What do you do when you don't have an essential vegetable on hand and it is time to make stock—run to the nearest store or borrow some from a neighbor? Neither is something you want to do too often, particularly if you have little time for cooking. The answer is to keep a good supply of dehydrated vegetables on your shelf. They are a good alternative for fresh in both soups and stocks. When the vegetable is out of season, the dehydrated form is often better than the fresh equivalent in the store and often a great deal less expensive. You can add them directly to the stock pot without rehydrating, unless the recipe specifies sautéing them.

Dehydrated vegetables are not always readily available, either. Natural food stores may have them in bulk but a well-stocked supermarket may also carry them. If you live in a community with a substantial Mormon population, you're more likely to find foods in dehydrated

form, because of their tradition of keeping a year's supply of food in every home. Wherever you can find any, keep a supply of commonly needed soup and stew vegetables in dehydrated form for emergency—onion, carrot, celery, bell pepper, mushroom and tomato. Of course, if you have a dehydrator, make your own supply.

What to put in the liquid

Consommé, that you always serve clear, is in a class by itself. It is so flavorful, so delectable and so appetizing with its crystal clear dazzle that they need no enhancement. If you are ambitious enough to make consommé, serve it in cups (traditionally having two handles) for sipping.

All other soups need some kind of a body, some kind of texture that may be:

• very fine as in a purée

• chunky as in minestrone

• thickened liquid with chunks of meat or vegetables, as in a stew

• clear, highly flavored liquid with the least body, as in chicken soup—you add vermicelli, carrots and peas, which offer varied color, flavor and texture, to complement the base and each other.

If you follow a good soup recipe, it often recommends the appropriate soup body. If you are constructing a free-form soup, the responsibility is on your shoulders to make sure that the flavors don't clash, nothing dominates and you've included a variety of textures and colors.

Enhance and enrich

Thickening

Each ethnic cuisine deals with its soups its own way. Some cultures thicken all their soups, others very rarely or not at all.

Clear, very flavorful soups do not need thickening. And for any first course soup your best choice is to omit thickening. If the soup serves as a more substantial part of the meal, thickening is a good idea. Here are some ways to thicken your soup.

♦ Purée some of the vegetables ingredients and stir the purée back into the soup. Reheat and serve. Very simple, very effective and you need not add anything extra. You accomplished thickening with the fine-grained particles that contribute to bite.

♦ Add starch indirectly by using starchy fillers such as noodles, potatoes or rice. This serves as both real thickening—thanks to the starch in these fillers—and perceived thickening because of the heavier body in the soup: solid pieces that fill your spoon and mouth. These kinds of soups are quick, cheap and you produce them with minimal labor—the choice for many restaurants or your busy everyday fare. These tend to get boring.

♦ Egg yolk is also an effective thickener. Beat the egg yolk with heavy cream, then add a little hot soup while stirring vigorously. When the mixture is a smooth paste, add a little more hot soup and mix again. Then pour it slowly into the pot of soup, stirring continuously. A few more minutes of cooking thickens the entire pot. If you add egg yolk to a hot soup without tempering, the protein in the yolk coagulates at once in the hot liquid, and the result is a thin soup and tiny floating specks of cooked egg yolk and blobs of cream—a disaster.

  A soup thickened with tempered egg yolk and cream gains extra richness and a golden color (not to mention cholesterol and calories). One egg yolk combined with one tablespoon cream

thickens about a quart (liter) or 4 servings of soup. It doesn't thicken it so drastically that you need a knife and fork to eat it, but it does add a light body.

- Chinese cooks sometimes thicken soups by adding whole eggs. For egg drop soup, for example, you first thoroughly scramble whole eggs, and pour them into the hot soup in a slow, steady stream without stirring. The instantly-cooked eggs provide a body that doesn't really thicken the liquid but gives the soup an altogether different consistency and feel.
- Asian cooks also use cornstarch as common thickener. They use it more in stir fries and sauces, but occasionally for soups, too. To do so, dissolve the cornstarch in cold water, stir it into the hot soup and cook for a few seconds until thickened. Cornstarch only thickens liquid, it doesn't add flavor or any extra chunks, but if you do a poor job of dissolving it in cold water, you get the dreaded lumps. The proportions are 1½ tablespoons cornstarch in 3 tablespoons cold water for a quart (liter) of soup. You may use other root starches, such as tapioca and arrowroot or even plain flour (see discussion of starches, under Desserts).
- In French cooking, and in the New Orleans cuisine, chefs favorite thickener is the roux. Any cuisine with strong French influence also has roux at hand at all times. Roux thickens sauces, creamed vegetables, even stews, but is also great for soups. It is simple, effective and adds a hint of new flavor to the thickened dish.

How to thicken with roux

Roux is simply a cooked mixture of fat and flour in about equal proportions. There are three types: white, blond and brown (chefs also label them as light, medium and dark). You prepare all three the same way over heat but remove them from heat at different stages. You cook white roux for just a few minutes until the flour barely begins to color but has lost its raw taste. This is good for light sauces, delicate soups and creamed vegetables. Blond roux you cook longer, until the flour turns a light beige, the color of croissant. It is best for more robust sauces and hearty, flavor-rich soups. In brown roux you allow the flour to darken even more to the color of pumpernickel and you use it mainly for robust gravies and sauces, real hearty soups.

Cajun cooks use an even darker roux—almost black, the color of a dark bittersweet chocolate. To do this, add oil to a very hot skillet, dump in the flour and with vigorous stirring make the roux that blackens in seconds. In such a very hot skillet the starch granules damage enough so they lose their thickening power. However, the browning reaction and caramelization develop great new flavors. This sort of roux is not to thicken but to enhance flavor.

Roux contributes flavor, owing to the partially cooked flour, in addition to its thickening power. The longer you brown the flour, the less its thickening ability. For the same degree of thickening, you need more brown roux than blond or white roux.

A neat professional trick is to use two different types of roux in the same dish—dark roux for flavor and light roux for thickening. In French and Cajun cooking prepared roux of all types is always by the stove so in their kitchen it is easy to blend two types. The home cook usually has no such ready access.

You can mix butter or oil or a combination of these two with flour to make any of the three roux. For extra flavor in subtle soups, butter is best. In an already rich soup, the butter flavor is so overwhelmed you might as well use oil. Cajun cooking uses lard for real richness and plenty of flavor. It also uses roasted meat or bacon drippings but these mostly in roux for thickening sauces.

To make a roux, cook the flour and fat over low to medium heat, stirring continuously.

Don’t rush, the process is slow and that's one reason roux is less popular. It takes too much time. When the roux has turned the appropriate color, stir in a little cool soup to form a paste. For a lump-free roux it is critical that you stir continuously and add the liquid slowly and gradually. Lumps are often a problem for less experienced cooks, another reason cooks turn the page when they read a recipe that requries roux. Continue to add liquid slowly until the paste is thin as cream. Then stir it into the soup, simmer for about 10 minutes to get rid of the raw flour taste, and there you have it—a nice thick soup with a good body. A blond roux you make with one tablespoon each of flour and fat provides adequate thickening for a quart (liter) of liquid.

If you’re a frequent user of roux for sauces, soups and vegetables, you can prepare quantities in different shades of color in advance instead of making it up each time. Store the extra in the refrigerator and scoop out a little whenever you need it, diluting it with a small amount of hot liquid to make a paste, then adding it to the pot. This is a simple and elegant thickening, but it is not used much in North American cuisine. If you do any French or Cajun cooking, it is an quintessential part of the process.

The technique of making a roux is simple and foolproof if you observe a couple of points. Be patient with the browning process—do it slowly. Add cold liquid to the finished hot roux just as slowly, making a uniform, velvety, lump-free paste.. If lumps appear, they won't disappear as you continue cooking your dish, no matter how much you stir or wish them away. If that happens, either skim off as many of them as you can from the surface of the soup or press the lumps through a fine sieve or pretend they are intentional—perhaps a new-age garnish. After all, an important part of being an accomplished cook is handling minor disasters with aplomb.

When you use a cold roux from your refrigerator, add hot liquid to cold roux.

The finishing touch

When it comes to soups, the term garnish is ambiguous. It refers to edible stuff that cooks add to the soup to make it richer, more hearty and satisfying. But it also refers to items they add at the last minute to make it more appetizing looking, more appealing to the eye.

Garnishes of the first category you add in small amounts and are not meant to change the flavor (though some garnishes are very tasty by themselves). A simple garnish for this purpose is pasta, a vermicelli or any other thin pasta shape. Others are more complex, like tortellini filled with cheese or even meat, tiny meatballs or matzo balls. Then there are cute little things called soup puffs (they used to go by the name dumplings but that gives the wrong connotation) that are basically irregularly-shaped egg pastas that you make yourself from flour, water, egg and salt (see recipe). The most fun and satisfying garnishes are always the ones you make yourself.

Soup puffs

These soup puffs are like a rich home-made Italian egg pasta or German spaetzle (spätzle). It takes minutes to prepare and they add glamour to any hot soup. You can also make a soup puff dough into vermicelli if you knead more water in the dough until it is thin as mashed potato. Then press this through a strainer directly into the hot soup.

Ingredients

1 egg yolk

3 tablespoons flour
1/8 teaspoon salt

Procedure

1. In a small bowl, beat egg yolk with fork, add flour and salt, stir with a spoon to make a dough. Add water teaspoon at a time to form a medium-thick dough. Let dough rest for 5 minutes.

2. Dust a small cutting board with flour and dump the dough near one edge. Hold the cutting board over the simmering soup, pinch off raisin-size pieces of dough with a small paring knife or a spoon and drop them in the liquid. Stick the knife or spoon in the hot soup momentarily to prevent dough from sticking to it. When all the dough is in the soup, give the puffs another 3 minutes to cook. Taste one to make sure.

Makes enough soup puffs for 4 servings.

Wontons, meatballs and matzo balls are more complex, and they lend a completely different character to your soup. They dress them up like if they were ready for a party. In fact, they can hardly be called additions—they metamorphose your soup to something else. These have strong flavors of their own, but those flavors remain sealed inside the individual pieces and don't alter the flavor of the soup. Other garnishes do change the flavor, for example liver puffs.

TASTINGS Simple garnish ideas
Finely shredded lettuce, sprinkling of grated cheese, croutons, herbs, crisp pieces of bacon, small edible flowers, slivers of citrus zest, slices of berries, tiny dollop of sour cream, yogurt or heavy cream (swirl any of these in with a spoon so it is only partially blended).

Another category of garnishes is decoration garnishes. They dress up your soup so much with so little effort that there is no excuse not to use them even for everyday meals. They really perk up packaged and canned soups. Anything edible that floats and looks pretty is fair game.

On top of everything else

Strictly speaking, a handful of crumbled saltine crackers spread over your soup is a soup topping. French bread or toasted slices of bread, as in the traditional French onion soup, offer a more elegant presentation. But a pastry soup topping is a true *tour de force* for any cook. Preparation is time consuming, but you are guaranteed a spectacular impression. Mix and roll out a baking powder biscuit dough, cut to fit individual ovenproof soup bowls, float each on top of very hot soup in the bowls, then bake in the oven until the pastry cover is done and golden brown.

You serve pastry-type soup toppings only on main dish soups, because, with covers which your guests eat along with the soup, this course becomes quite hearty and filling. And the soup must be able to survive the extra baking time the pastry cover needs. Think of the soup ingredients. Will they become overcooked or harmed by the extra time in the oven? Any robust soup that had been simmered for some time is a fine candidate.

You can also use puff pastry for a soup topping, and this is the biggest challenge of all (see recipe). Once you learn how to produce puff pastry, you can use it many different ways in your cooking. If you're timid in the kitchen, you can find commercially prepared puff pastry in the grocery store's frozen foods section.

Any of these toppings are also excellent over stews.

Puff pastry coat for soups and stews

Making your own puff pastry is a useful skill to have. It is not an easy kitchen task, yet takes no more than average experience. Puff pastry is so versatile for many savory and sweet preparations, that it is worth the effort to learn how to make it. Make your own (see recipe below) or buy a commercial preparation from the freezer section of a high-end market or well-stocked supermarket. A well-puffed, cinnamon-brown pastry covering a bowl of soup (or stew) is positively a show-stopper presentation. The guests don't even mind the struggle to cut through it to get to whatever you've hidden below.

Ingredients

1 recipe puff pastry (about 1¼ pounds or 570 g) (see recipe under Desserts)

1 egg, beaten with 1 tablespoon water

Procedure

1. Let the chilled dough warm up slightly for about 5 to 10 minutes. Roll it into a very thin sheet on a flour-dusted wax paper. Using one of the individual serving bowls as a guide (in which you plan to serve the soup or stew), cut the dough and the wax paper together with a sharp knife into circles a finger wider than the bowl. Place the circles on a baking sheet wax paper down and refrigerate for 15 or 20 minutes to chill the dough and relax the gluten before baking. Preheat the oven to 475°F (250°C). While waiting for the dough to chill, you may use the pastry scraps to create decorative motifs for each bowl that you'll stick on top of the pastry. They can be any design, names, initials, even poems, if you wish.

2. Bring the soup to near boil. When the soup is hot and the puff pastry is chilled, lay out 6 individual ovenproof serving bowls. Brush a small amount of beaten egg on the outside rim of the bowls, then fill the bowls with hot soup. Place the chilled circles of dough over each bowl wax paper side up, and press the edges of the circles against the outside rim of the bowls. The egg acts as a glue, sealing the dough to the edge of the bowl. Peel off the wax paper and cut ventilation slits in the puff pastry dough. If you have decorative pieces, stick them on top now with another dab of beaten egg. Work quickly before the puff pastry warms up too much. Brush the entire creation with egg wash.

3. Place the bowls on a large baking sheet and bake in the middle of the preheated oven for 10 minutes, or until the pastry is beautifully brown. Since it is thin, it bakes quickly.

Makes 6 servings.

A chilling thought

Chilled or iced soups have always been popular in France and in cuisines influenced by

the French, but they didn't gain recognition across the Atlantic until the 1980s. Chilled soups are not only elegant and different, but free the cook from worrying about one course on the day of a dinner party—you prepare them well in advance. They are particularly suitable for plush dinner parties with many dishes. You are ready to serve the first course directly from the refrigerator.

These soups have the nutrition and satisfaction of a good hot soup and most are low in calories and either fat-free or very low in fats.

TASTINGS Chilled soup varieties

Nearly any fruit is excellent as a base for a chilled soup. Examples are sour or sweet cherries in red wine, raspberry in champagne, blueberry or lingonberry in buttermilk, avocado, cantaloupe, cranberry, gooseberry, rhubarb, orange and orange custard, lemon and lemon meringue, peach-plum, apricot, mix dried fruits, mango and apple. The list is endless.

Some vegetables are also good for chilled soups such as zucchini, tomato, cucumber, beets, spinach, lettuce and green peas.

Chilled soups don't appeal to everyone. They may be too novel items for the meat-and-potato crowd. Many people are reluctant to attempt a new type of food (aren't there enough scary things in life?) and chilled soups are new to many. Some of your less adventurous guests will take a tentative spoonful and leave the rest. Others will demand the recipe and want second helpings. When you serve a chilled soup at a dinner event, it provides both immediate appeal and a promise of more unique courses to follow.

There are two general types of chilled soups—savory and sweet-sour. You can make either with a chunky soup body or as a purée. You use little or no fat or oil—the greasy look is unappetizing in cold foods. You may enrich the soup with sour cream, sweet cream or yogurt because the fat and oil in these don't separate to float on top of the cold liquid.

Savory chilled soups are simple defatted soups. Only a few are familiar to North American eaters—gazpacho, borscht, vichyssoise. None of these is a quick or easy soup to make. A number of less-traditional ones that you can put together in less than 15 minutes are cucumber-lime, curried cucumber, curried chicken, fresh tomato with red wine or zucchini-onion, to give a few examples.

Sweet-sour chilled soups are often fruit-based, and they rarely take more than 15 minutes to prepare. They are slightly sweetened, thin-bodied fruit concoctions, often with something tart added to complement the sweet fruit taste. The tart choices are lemon, lime, wine, sour cream or yogurt.

Chilled soups are scrumptiously refreshing on a hot summer day. An added decorative garnish (tiny flower, leaf, complementing herb) is almost compulsory—the soup practically cries out for it. For a truly elegant presentation serve a fruit-based soup in a small, scooped-out melon half, and your guests can even eat part of their soup bowls. It is a delightfully attractive presentation.

Points to Remember

- When planning your menu, make a clear distinction between appetizer salad (light first course), accompaniment salad (heavier side salad to go with entrée) and hearty main-dish salad.

- Get in the habit of making your own salad dressing; build you repertoire from at least half a dozen good, tested recipes.
- Learn to create beautiful composed salads; offer main-dish salads often as hearty, nutritious, satisfying alternative meals.
- Make your own stocks or broths and make large quantities, freezing some for future use.
- Accumulate stock ingredients in your freezer from vegetable scraps, pieces of meat and bones.
- Find a commercial substitute for home-made stock that you like and always keep some on your shelf.
- Keep dehydrated vegetables suitable for stock in your pantry when you are out of fresh produce.
- Learn several ways to thicken soups.
- Learn several ways to enrich soups with body and garnish
- Learn how to use a top pastry crust over soups.
- Get into the chilled soup habit for quick, easy first course prepared well in advance.

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A worm in the cabbage
is better than no meat at all.
Pennsylvania Dutch proverb

MEET MEAT

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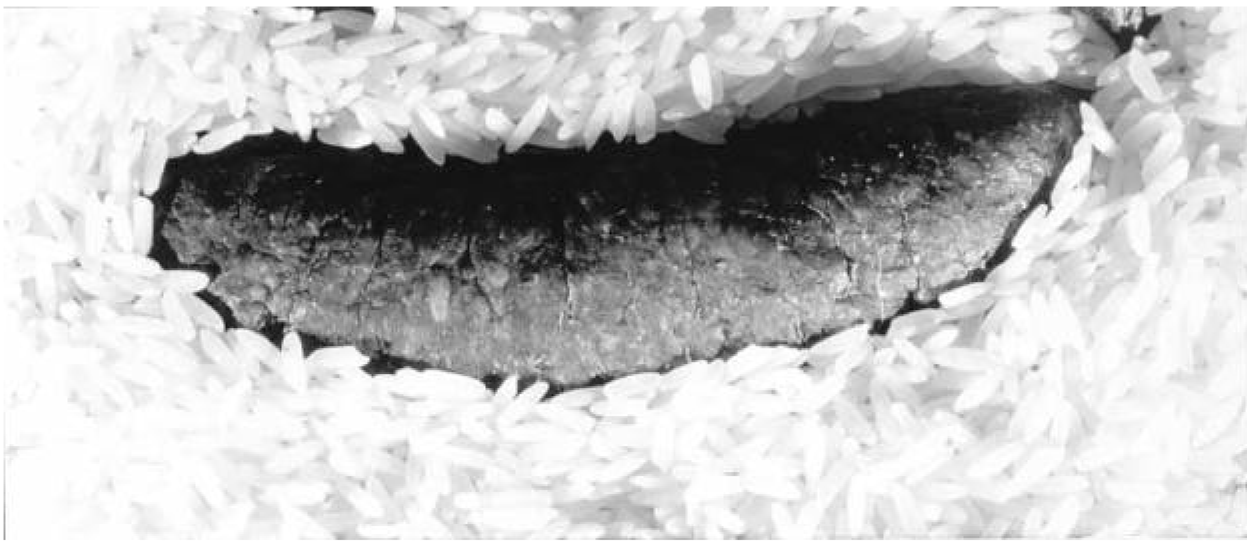
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Years ago I spent a summer working in the Canadian wilderness, somewhere in northern Quebec. Olaf, my boss, was a delightful man, a pleasure to work for, and while we were camping in the wilds, we took turns preparing meals. Olaf's cooking skills were weak. He mostly knew how to open cans and heat their contents on the camp stove. My kitchen skills weren't much better. So whenever we got back into civilization and came upon the first small town, we hit the first decent-looking restaurant. Although that was often just a mild improvement over our own camp cooking, at least we didn't have to clean up.

One day, after camping for two weeks and driving for hours, we arrived at a remote mining town. It was well past lunchtime and we were famished. A dubious-looking little diner appeared to be our only choice for a meal. But all diners in these small towns are dubious-looking with questionable menus.

We walked into the dining room, which held a dozen or so tables. Everything looked ancient but reasonably clean—oilcloth, plastic flowers and plastic vases on each table with real dust on them—a glass-fronted counter displaying the usual donuts and cakes—the type of place that can surprise you with decent food, but don't count on it.

We were the only ones in the diner. A short, balding French Canadian cook covered by a spotted off-white apron came out of the kitchen with the menu, a single sheet with very few entries written in French. Olaf's eyes lit up at the word "steak," and even though there was no indication in either English or French what kind of steak, or even what kind of animal the meat came from, his selection was quick and unhesitating. He hadn't had any decent meat for some time and a thick juicy steak was always his first choice when eating out.

I was a little more cautious and went with the "*poisson de jour*," figuring that there was no way beef could be local or fresh but a slight chance that the fish might be.

The cook/waiter/busperson brought water and a basketful of very good French bread (a promising start), then returned to the kitchen to prepare the orders. Within a few seconds, our conversation and our thoughts about the upcoming meal were disturbed by loud thudding noises coming from the other room. Was the place being remodeled? The pounding continued, actually shaking the tiny building, then stopped. I hope they are not getting dust in our food, Olaf said. Then we heard the sizzling sound of frying. Could that have been your steak being tenderized, I asked Olaf jokingly?

Ten minutes later the meal was served, and Olaf's only consolation was that the steak would have been completely inedible without some mechanical or chemical intervention. The cook's sledge hammer technique allowed him to at least puncture the chunk of stuff on his plate with a sharp knife. If my *poisson* of the day came from a local lake, it was a long time ago, but I could at least cut the bland result with my fork.

Meat, the Universal Food

History hasn't recorded a human society that doesn't include meat in its diet. Animal protein and fat have been a part of human nourishment since prehistoric times. For most people in the western world, meat once a day is essential for food enjoyment. And that doesn't include poultry, fish and shellfish. Why is meat so essential in the daily diet? For one thing, meat gives immense eating pleasure, and for another, the human body instinctively recognizes and craves the high nutritional value of meat—its chemical composition is similar to that of our own bodies therefore eating meat closely approximates our bodies' chemical needs.

Scientists and anthropologists speculate that it is the large human brain’s need for extra energy and nutrients—compared to lower animals—that compelled humans to search for high-quality foods. At rest, the human brain consumes 20 to 25 percent of the body’s energy need, while other primates use only eight to nine percent. Meat is the choicest of the high-quality foods with high protein and fat. Grubs, worms, insects are also excellent choices but, fortunately or unfortunately, our ancestors did not choose them for their stone dining tables. Or if they did, the tradition did not pass down to us.

Meat is the flesh of any animal, most commonly beef, pork and lamb. In North America, we consume beef and pork far more than lamb and veal. Americans are some of the most ardent meat consumers in the world. In per capita consumption for beef, we rank only behind Argentina and New Zealand. Only Germans and Poles use more pork per person than Americans. We're ranked first in poultry consumption, but in lamb and veal we are way behind many other countries. Beef still is our favorite, representing 43 percent of all the red meat in the 1990s. Pork represents 20 percent. During the 15-year period between 1980 and 1995, both beef and pork consumption per capita declined slightly, beef by 9.7 percent, pork by 4.0 percent. Poultry, seafood and no-meat dishes replaced the beef and pork.

Meat is often the most costly part of the meal, and other foods tend to center around it. It makes good sense that you strive to make the very best out of any cut of meat that is under your care. Learning and experience help, and the more meat cooking knowledge you have, the better equipped you are to transform that red lump of flavorless muscle into succulent, juicy, tender bites. Meat is still one of the easiest and quickest items to cook. It is also easy to ruin without solid kitchen experience and a good recipe to guide you.

Meat ancestors

Humans first domesticated cows about 8500 years ago in southwest Asia, where they originally lived wild. The domesticated version slowly and steadily spread throughout the world. Today there are few places where cows are not part of the landscape and beef not part of the menu.

Over the last several millennia, the original cows were bred, re-bred and crossbred to yield maximum meat under local climatic conditions. Some breeds do well in the grassy areas of Montana, others in African savanna, and still others in hot, dry, harsh climates like the Southwestern U.S. Some breeds put on weight fast, others grow slowly. Some gain more fat as they mature, while others remain lean. Some mature very early. Now we have special breeds for maximum milk production and others for fabulous, well-marbled meat. Today's American ranchers custom-raise beef for specific purposes and slaughter them at optimum age and weight. The beef you buy in the supermarket or butcher shop comes from young cows and bulls that weigh about 1100 pounds (500 kg).

The first record of domesticated pig goes back to 6900 years ago in China. Our modern pigs, however, are descendants from two species of wild boars, one from Europe and the other from East India. Like cattle, pig farmers breed modern pigs for specific traits. The farmer looks at a particular porker and sees bacon or ham or pork roast and raises that porker to give the most whatever the demand is. Today's pork is far leaner than just a few decades ago, mostly because of changing consumer preference. The average pig weighs about 240 pounds (110 kg) and is still a young animal when it becomes pork chops.

Processors use virtually every part of the pig for some purpose or other, whether as meat

for the dinner table or in animal feed. Sometimes the pig heart valves replace defective human heart valves, and pig skin in treating human burn victims.

Sheep was the first animal domesticated by humans, first tamed 11,000 years ago in the Middle East. Goat was a little later, about 9500 years ago. In many countries lamb, mutton and goat are very popular meats, partly because they are easy to raise on inhospitable grazing land. Another major reason for this popularity is that they are among the few meats in the world having no religious or cultural restrictions. In North America we only consume young sheep as lamb. It is not nearly as popular as in other parts of the world, ranking about the same as veal. This is surprising as almost all lamb on the market is tender and flavorful, one of the best available anywhere in the world. The rancher raises the animals on optimum feed until they reach about 100 pounds (45 kg) at an age of between five and ten months.

Nutrition

The majority of meat we use as food is muscle of an animal. Meat is highly nutritious, particularly high in protein. Pork and beef are 15 to 22 percent protein, the rest is 68 to 80 percent moisture (basically water) and 0.5 to 20 percent fat. (In dietitian language that translates to 17 to 25 grams of protein and 0.6 to 23 grams of fat in a four-ounce serving.) The fat here is not the obvious trimmable, outer layer fat but the internal, built-in fat that are an integral part of the muscle tissues and cells. This is the barely visible and invisible fat that gives people on reducing diets a major setback.

America's love of meat has brought warning from nutritionists, dietitians, physicians, and the surgeon general of the U.S. We eat too much meat, too much fatty meat, and this can impact our health. Though we should heed the warnings, we need not eliminate meat from our menu. We just need to plan our menus wisely and include meat in moderation.

Other important part of meat are micronutrients such as minerals and vitamins. Micronutrients are in tiny amounts and are also essential to the smooth operation of our bodies. They occur in two different parts of meat—water-soluble minerals and vitamins are dissolved in the moisture of the muscle and fat-soluble ones are in the fats. Should we completely eliminate fat from our diets, we would deprive our bodies from fat-soluble micronutrients. Without supplements, our bodies could not operate.

Shrinking the fat

It is hard to change old habits, especially old eating habits. The feel of the food in your mouth and the flavor are almost as essential as its ability to fuel your body. Lean meat doesn't have nearly as much flavor as fatty, or at least well-marbled meat, so when you trim the fat, the accustomed texture and flavor also change. Yet, people have been taking warnings of eating too much fat seriously. The demand for low-fat meat is strong enough that the entire team is paying attention, from geneticists to agronomists, ranchers and feed lot operators, to packers, processors and retail butchers.

They have all helped to trim down meats to lean. Economic incentives encourage livestock growers to sell leaner animals. Heavy-bodied "lard-type" hogs, which used to fetch premium prices at the slaughter houses, are no longer in demand. Today's livestock grower is raising breeds that start as genetically leaner. Then he selects the leanest animals in the herd for further breeding to get the leanest of the lean. Cross-breeding is another powerful tool in

decreasing the fat content of the cut of meat on your plate.

What the grower feeds his livestock is another important area that impacts the fat-to-lean ratio in meat. The total amount he feeds to the animals, as well as the balance of fat, protein and fiber in the feed, can do a lot to keep animals trim. Both trimmable, outside fat and internal marbling are affected by the animal's diet. Age of the animal at slaughter is a factor, too. Meat from younger animals is leaner. The more mature the animal, the higher the fat-to-muscle ratio (which is generally also same in humans).

For example, some Montana ranchers began selling specially bred extra-lean beef raised without hormones or antibiotics at a cost of about 15 to 20 percent more than regular beef. To further reduce fat, they market these animals at a younger age and keep them on feed lots for only a short time. The result? The meat has minimum marbling, reduced flavor, it is dryer and less tender. Today consumers' acceptance of lower flavor, less tenderness and higher prices in exchange for lower fat is still questionable.

Genetic modification of meat animals is highly controversial, though it holds the greatest hope for leaner meats. Genetic engineering can delete, add or mutate genes within a specific site in the DNA to dictate a favorable muscle-to-fat ratio. Consumers are wary of such meddling with meat and today we still don’t know if they will accept it or not.

Lower-fat processed meat is a different story altogether. Processors can custom-tailor such meat to consumer needs to provide lower-fat, low-fat or no-fat products. The problem is the cost of the ingredients that they add to replace the fat. If the processor replaces 35 percent fat in a pound (half a kilo) of bologna, something has to take its place so the bologna still weighs one pound (half a kilo). Since fat is cheap and the consumer is reluctant to pay a premium price for no-fat bologna, the processor has to come up with a cheap substitute for fat.

Both air and water qualify. It is hard to pump air into meat and not have the consumer complain (although we buy enough of it in ice cream that could be 50 percent air), but the processor can pump in a substantial amount of water with a binder substance to hold it. Water in meat even has advantages. It has the lubricating quality of fat, and it creates a sense of juiciness. Palatability, texture and a meaty consistency must be retained, too. Cheap or not, the processor can only inject just so much water. Injecting more there is too much loss of flavor.

Another problem with adding water is that bacteria thrive with increasing moisture in their environment. How does the processor solve this problem? By adding more chemicals to preserve the product and lengthen shelflife. So now we have no-fat bologna with 35 percent water to replace the fat and extra chemicals to preserve the more perishable product. *Bon appétit*!

Meat Basics

All but our organ meats have three distinct parts—muscle, fat and connective tissue. All three are edible and digestible, but only the first two contain nutrition and flavor. Fat is the reason for our dietary problems, but connective tissues are the ones to give us headache in the kitchen. Once we learn how these problem connective tissues react to various cooking techniques, we have the key to tender meat dishes.

To offer the most tender, juicy morsels of meat, let’s first learn a little about the three parts—muscle, fat and connective tissue.

Muscles

Muscle fibers are individual meat cells—long, thin threads—something like the long fibers of a celery stalk but less regular in arrangement. When you cut into a beef brisket, which has an unusually coarse texture, you can actually see the individual fibers. In most cuts of meat they are not that obvious.

The individual fibers are not strong enough by themselves to do the work they were designed for, so many are bound together to form a solid bundle. Like a rope, each strand has limited strength, but when many are woven into these bundles, they form a strong body.

A thin but strong sheath of connective tissue holds each bundle of muscle together, like a shrink wrap, adding even more strength. The connective tissue helps prevent tears and injuries while the muscle performs its daily work in the body. Similar tough string-like connective tissues tie muscles to bones. When you eat improperly-cooked or poor-quality meat, it is the tough connective tissue that gives your jaw a workout.

Muscles split readily along the length of the fibers, like a piece of wood, but they are not easy to rip across. Think of a thick slice of tender roast pork on your dinner plate. You can cut it *along* the grain with your fork. But you need a sharp knife to cut across the grain, (i.e. across the fibers), no matter how tender the pork is. Yet when you carve meat, you always carve it *across* the grain. Why? The reason is that the slices on your plate rest so the fibers run up and down. Now cutting the meat on the plate you are cutting down *along* the fiber. It is easy to cut and easy to chew. Your knife and your teeth perceive this as tenderness.

Some muscles do a great deal of work in the living animal, for example, those in the leg and thigh. These muscles need greater strength, they have coarser and thicker fibers. An example is beef brisket.

Others muscles get little workout. Take loin muscles in the back. These muscles are there mainly to protect the backbone but are not often called on for any strenuous exertion. Loin muscles remain fine-textured with soft, thin fibers, as in a T-bone steak. We *perceive* soft, thin fibers as tenderness. The visual aspect of the meat also effects our perceived tenderness. The fine-textured surface of a porterhouse steak *looks* much more tender than the rough surface of a flank steak.

Hard-working muscles make flavorful meats. So we have tough, coarse-fibered meat with a lot of flavor and tender meat with much less flavor. A pork tenderloin, for instance, has a mild, subtle flavor compared to a pork chop. A good cook chooses a cooking technique that enhances what flavor there is and at the same time tenderizes the muscle, if needed, so eating it isn't a chore.

Fat

In our low-fat and no-fat world, people tend to forget that fat is not just a foul three-letter word. Our bodies could not function without fat and good cooking would also come to a halt. The enemy is not fat but too much fat.

From the cook's point of view fat is an essential part of meat. It is the only carrier of fat-soluble flavor ingredients, and they are a significant part of total flavor. Those flavoring chemicals that only fat can dissolve are nowhere else. Get rid of all the fat and you discard all those flavor chemicals, too. That's why lean meat is blander and flat-tasting. In fact, it is the fat that gives a meat its characteristic flavor. The composition of fats varies from one species of animal to another. Without fat, we wouldn't be able to distinguish veal from pork or lamb from beef. They would all taste the same. Prove this for yourself. Mix pork fat into ground lean beef

and cook it. It will taste like pork, not like beef.

Lean meat is also tougher because the lubricating fat is missing. In a sensory panel test at the University of Georgia, broiled ground beef made up of 25 percent fat received consistently higher scores than the same ground beef containing only 15 percent fat.

Fat in meat may be obvious as thick coating over the surface, or it may be hidden in tiny pods, sheets or pockets of varying thickness within the muscle. Some fat is so small they are hardly visible. Others are coarser, giving the meat marbling and a delight to a true meat connoisseur.

As you chew a lean bite of meat, after a few moments it begins to feel dry in your mouth and that's why a good cook plans to prepare any lean meat with some added fat. The best cooking method for veal, which is naturally lean, for instance, is either frying (wienerschnitzel), serving with a rich sauce (veal scallopini) or stuffing with high-fat ingredients (cheese or ham). The fat you add supplies the pleasing mouthfeel.

In developing countries consumers don't differentiate between muscle and fat. They consider all parts of the meat of equal value. They not only tolerate high-fat meats but often prefer is. Because people in these countries work physically harder, the higher fat intake causes no real concern or harm as it does to people of a more sedentary life style.

Connective tissues

Connective tissues are tough, strong organic material. They are proteins and there are three types—*collagen*, *elastin* and *reticulin*. All three are tough as tires, barely chewable, thus the more connective tissue you find in your meat, the tougher the cut is. Of the three proteins, collagen is the most common and, fortunately, it slowly converts to a soft gelatin over heat if you use the right cooking method. The other two, elastin and reticulin remain tough no matter how long you leave them in the pot or over the grill.

Meet your Butcher

It is odd that in America we eat a huge amount of meat, yet we choose only a few familiar cuts. Even knowledgeable cooks have problem when browsing at the meat counter. This is not surprising when you consider the enormous number of names of meat cuts in the butcher’s case. No government or private agency regulated names prior to the 1970s. Butchers and wholesalers gave their own names that were acceptable regionally and within the local ethnic communities. The same meat cut may have had an entirely different name as you traveled to different regions.

We have some 300 different fresh cuts of beef, pork, lamb and veal in butcher shops, with over a thousand names in Canada and the U.S. The same cut could have had a dozen different names in different locations. Finally some relief came in 1972 when the U.S. meat industry coordinated a major effort to come up with a system of country-wide uniform names they called the Uniform Retail Meat Identification Standard. Processors, wholesalers, retailers and butchers accepted the recommended 314 names that we still use today. The Canadian Meat Council introduced a very similar system.

This is still a huge number of names for the average consumer. When you have questions, butchers are singularly unhelpful. They know the common cuts within their areas. How many times have you asked for a particular cut specified in a new recipe, but the butcher just smiles

and shakes his or her head? The system is still too cumbersome and anything but user-friendly. But let’s make the best of it.

Read the label

All meat labels today include three names—the first one gives you the kind of animal the meat comes from, the second is the primal (also called wholesale) cut from which that piece come and the third is the specific name of the cut. For instance, in *beef top round*, beef is the animal species, round is the primal cut and top is a specific cut of the round muscle. If it is ground meat, the butcher only has to specify the kind of animal and the maximum fat content. Meat labels also include the grade of meat, that gives us an indication of its quality.

Understanding meat labels is important, but it is also helpful to know how a certain cut is named. Decades of selective breeding and scientifically controlled feeding have developed animals that can potentially produce a superb piece of meat. An animal specifically bred for its meat is genetically a much better source for steak, for example, than a dairy cow too old to meet her quota of daily milk production anymore. The sex of the animal also influences meat qualities. Well-fed and well-managed animals provide meat superior to that of poorly cared-for animals. Many of these factors contribute to the final stamp the meat grader assigns to and rolls on the fresh carcass in purple ink.

Aging meat

Should you roast the meat of a freshly-slaughtered animal, you would get a tough, flavorless, nearly inedible meal, at least by today's standards. That is partly due to tightening of the muscles after death, which don't relax for at least 24 hours. When our prehistoric ancestors roasted a freshly-slaughtered pig or deer, they knew that they have to do it quickly before the muscles tightened or wait until they relaxed. But they also knew about aging meat for optimum flavor. They hung fresh meat for days to dry and age before cooking. Even chuck wagon cooks on Texas ranches wrapped fresh-slaughtered beef in canvas and hung it on a tree for several days.

Aging improves both flavor and tenderness. The higher the fat content, the more benefit you gain by aging. Although nearly all meat benefit from this process, beef benefits the most. In fact, unaged beef is not very good. What does aging do to the meat? A complex series of chemical processes alter proteins and fats and develop flavor compounds that, in some meats, grant the full meat flavor. Tough connective tissues also change slightly, gradually softening with aging. In the meantime, while the aging meat loses 12 to 15 percent of its total moisture, the flavors concentrate.

While all these chemical changes are taking place, the tight muscles continue to relax for about six days. The aging for a good-quality beef is at least 10 to 15 days, and for lamb is a week. Aging beef for an even better flavor may continue up to about six weeks.

While studying aging of beef, researchers cut and cooked steaks within three hours after slaughter. An experienced tasting panel described the flavor as sour, metallic, astringent, and not recognizable as beef. After aging the beef for a day they cut and cooked similar steaks that now the tasters recognized as beef, but they still complained about its astringent taste. Only after eight days of aging did it taste to them as a true beef steak.

TASTINGS Early meat transport
It is astonishing that we had refrigerated boxcars before home freezers. By 1875, the railroad was using ice, replenished at stations along the railway route from Chicago to East Coast cities. The real boost to meat transportation started in the early 1900s when mechanical boxcar refrigeration became available.

Unfortunately for meat connoisseurs, aging is an expensive process—it takes both time and costly storage space. There are two types of aging. In *dry aging*, they hang the meat in huge refrigerated rooms at temperatures just above freezing, 34° to 36°F (1° to 2°C). *Wet aging* is similar, but they pack the beef in vacuum packages as a protection against oxidation. This is even more costly. Every day of aging adds to the price the consumer pays for the meat. In dry aging, every day the meat loses more moisture for which you would ordinarily pay at the checkout counter. They only age the very best quality beef for several weeks, and these cuts are not available in an ordinary supermarket or butcher shop. Upscale restaurants, caterers and exclusive private clubs buy them. These types of businesses can add 50 percent extra to their meat costs and not hear any complaints. The cost of supplies for such establishment isn't a big part of the total bill, while a supermarket shopper balks at paying $10 instead of $7 for a pound (half a kilo) of meat. For the very best aged beef, visit your favorite restaurant or club.

U.S. and Canada also export well-aged beef. The Japanese are particularly fond of the superb American beef, and the people of several Southeast Asian countries are just as fond of the excellent pork.

To keep the price reasonable, meat processors age ordinary supermarket meat (and even butcher shop meat) for the shortest time possible, about 10 days. Even though a home refrigerator is not the ideal place to age meat properly, many cooks suggest buying beef and lamb several days in advance and letting it sit in the coolest part of the refrigerator to further improve its quality with the few extra days' aging.

While it is mandatory to age beef for at least ten days, a week for sheep and only a day or two for lamb provide the needed benefit. Veal, with its very low fat content and minimal connective tissues doesn't benefit from aging at all. Pork is not aged at all though the process would tenderize this meat, too. One reason is that pork is marketed especially young when the meat is fully tender and has little connective tissue. The slight improvement aging would give doesn't justify the extra cost. Another reason is consumer preference. Americans and Candians are used to the flavor of fresh, unaged pork.

Does red mean it is fresh?

Raw meat is red, or at least we think it should be. And if it has began to turn brownish, we assume it is no longer fresh. This isn't necessarily so. In a living body two red pigments, *myoglobin* in the muscle itself and *hemoglobin* in the blood carry oxygen. The meat of fresh-killed animal is bright red. These red pigments slowly oxidize into a third pigment, *metmyoglobin*, which is brownish in color. Even though this change is slow, the pigment oxidation happens more quickly than the deterioration of the meat. This means that a perfectly fresh meat may have already turned slightly brown.

But consumers want their meat red. If the color is not bight red, most consumers will pass that meat in the display case. It is the oxygen in the air that changes the red pigments into brown so keeping oxygen away from the meat retains the red color. Packagers have a choice of

packaging the meat in an impermeable, skin-tight wrapping or use chemicals and antioxidants. For example, antioxidant nitrites in sausages keep the meat bright red.

We all know that cooking also change the color of meat but we consider this a positive change. Browning meat quickly in a hot pan converts the red myoglobin to the tan-colored pigment called *hemochrome.* This color change takes place at 140°F (60°C). It happens to be that this is the temperature of a medium-rare steak. At this temperature both the red myoglobin and tan-colored hemochrome are present in our meat and the mixture of the pigments results in pink—the color of a medium-rare steak. Once you bring the meat to 175°F (79°C), you have converted all the red pigments and the meat color turns a rich sienna brown of a well-done roast.

Grading

Meat that you find in retail has a grade assigned by the Department of Agriculture. Grading is optional but meat inspection for wholesomeness, safety and correct labeling is mandatory. The sign that you may see on some packages in American markets "Inspected by USDA" is a meaningless gimmick. All meat is inspected by the U.S. Department of Agriculture.

For beef, the USDA uses an eight-level grading system, but only the top three grades reach retail displays. Actually, for all practical purposes, you only find two grades at your butcher. Only exclusive butcher shops and better-class food service establishments carry the highest grade, *Prime* beef. Butchers can special-order Prime beef for you if you can pay for it, but few ever carry it on a daily basis. Only 1 percent of the total beef in the U.S. is Prime grade.

Choice is the next grade level, the most common grade available at the supermarket. This grade makes up 45 percent of all beef sold. Beef that is graded *Select*, the third grade, isn't very tender and lacks good marbling. Supermarkets often sell this grade under their own grading system (for example, they may call it *Good* grade but meat departments choose any fancier name they want). The Select grade makes up 21 percent of beef sales.

Meat canners often use the lower Select grade meat. Only meat packers and processors use the remaining five grades below Select. There is also beef that is not possible to grade for some reason or other, this is called *No Roll* (named so because the inspectors don't roll their stamp on the meat).

The beef that cattle ranchers raise for Prime grade stay longer on the grain feed lot, so the meat becomes well-marbled and turn absolutely tender. If the ranchers raise them for Choice, they get a shorter period for munching on grain. That tells you why the price of Prime beef is about 15 to 25 percent more than the same cut of Choice. Select grade is 10 to 15 percent cheaper than Choice. When shopping, pay attention to grades marked on meat packages, not only to prices and appearance. What if there is no grade designation on the package? That almost certainly means a low-grade meat.

Grades of veal and lamb are similar to beef. For both types Choice is the most widely available grade, but if you can afford Prime, it is worth hunting for or special ordering it.

Even though the grade of meat is an important factor in its quality, there are many steps in the process from hoof to pot that give plenty of opportunity for mishandling. Problems anywhere along the line, for instance, not chilling it at the optimum rate in the processing plant, impacts the quality of the meat greatly. It takes a lot of knowledgeable people to guarantee the flavor and consistency of that piece of meat on your plate. The grade of the meat is easy to check but it is impossible to know how the long line of hands dealt with it until it reached you. The reputation of your butcher or meat market is your only hope.

Cuts

Before the wholesalers, meat cutters in the processing plant divide all meat into standard, convenient sections they call *primal* or *wholesale* cuts. This helps not only the butcher but the cook. Except for organ meat and ground meat, every meat label states from which section that cut came.

Beef is commonly divided into seven primal cuts:

- Chuck
- Rib
- Loin (includes short loin and sirloin)
- Round
- Brisket
- Plate
- Flank

Veal has five primal cuts:

- shoulder
- rib (rack)
- loin
- leg
- breast with shank

Pork has four primal cuts:

- shoulder (including the butt and picnic)
- loin
- leg (ham)
- belly

Lamb has six primal cuts:

- shoulder
- rack
- loin
- leg
- flank
- breast with foreshank

TASTINGS Is it a steak or a chop?

Do you know the difference between a steak and a chop? These are old terms from times when butchers cut meat with hand tools. Any meat that had bones thin enough for the butcher to chop into slices with a hand tool he called a chop. Anything that he had to saw through was a steak.

Preserving Quality

Because meat animals are often too large for one or two meals, our ancestors had to devise ways to preserve it for weeks and months without deteriorating its quality.

There are only two processes that spoil meat—bugs including microorganisms, insects and other creatures that feed on it and oxidation. Living organisms only grow in the presence of moisture and multiply rapidly at warm temperatures. Today we can protect meat from all tiny creatures but microorganisms. If we reduce the temperature, the bacterial activity slows drastically. Freezing does the same thing, but it adds another factor to make the environment radically unsuitable for their survival. It converts the meat's moisture into ice, that microorganisms can't use as a source of water. Frozen meat doesn't spoil by microorganisms. But remember, even though most microorganisms die, some survive freezing and they remain dormant. As soon as you defrost the meat and its temperature warms up to their favorite lukewarm, they begin to make up for lost time and multiply quickly.

Most microorganisms only grow in the presence of oxygen, but some need an oxygen-free environment to thrive. Still others can grow in either. Most prefer neutral acidity (pH 7). Not many grow in acid conditions (below pH 5). So meat is relatively safe in acidic conditions, as in an acid marinade, or in a pickling solution, but lack of oxygen doesn't guarantee its safety. The bacteria of the dreaded deadly botulism live in low-acid, oxygen-free conditions. Fortunately, heat readily destroys this deadly toxin.

Oxidation, the second reason for spoilage, only affects fat. It is particularly hard on unsaturated fats. That means meats like chicken, fish and pork are more susceptible, while meats high in saturated fats, like beef and lamb, oxidize more slowly. Oxidation of the fat is simply a chemical reaction that turns meat rancid. A mildly oxidized meat has a slight rancid, unpleasant flavor but a strongly rancid meat is quite repulsive, difficult to swallow. Even if you somehow manage to swallow it, rancid meat is also difficult to digest.

Oxidation (or rancidity) is an irreversible chemical reaction that goes on spontaneously in the fat of either raw and cooked meats. Storing meat in the refrigerator slows the process down a lot because chemical reactions slow at lower temperatures. Below freezing it slows down even more. In fact, oxidation is the only limiting factor when storing meat in the freezer—without oxidation, a well-wrapped meat (to prevent drying) would keep indefinitely.

If it weren't for oxidation, we could eat the mammoth that they found frozen in Siberian ice for 20,000 years. It should be perfectly edible and certainly well aged. Russians claimed they actually tasted it and liked it, but then, they are not used to our tender, prime-grade, corn-fed western beef..

Wrapping

The only way to stop oxidation is eliminating oxygen completely from the environment surrounding the meat. Meat packed in perfect vacuum will last forever. Commercial vacuum packaging doesn't eliminate all oxygen from the package but greatly reduces it and extends shelflife significantly. A vacuum-packed meat has a shelflife of at least four weeks, while a standard packaged meat lasts less than a week. Today whole-sale processors ship almost all meat to retailers in huge vacuum packs. The old-fashioned butcher shop where the butcher carves up fresh carcasses is as rare as steak tartar. With carefully controlled operating-room-like hygienic conditions and vacuum packaging, meat packagers extended shelf-life of pork, for example, to an unbelievable 45 days. That allows them to ship fresh pork by refrigerated trucks from the east to the west coast, then by ocean liners to Southeast Asia and still arrive in top condition as fresh pork.

While we see meat in the display case on trays sealed in plastic wrap, high-tech (called

active) packaging has arrived and we'll see more and more of it. In such a package an inert gas replaces air thus eliminate the harmful oxygen. They also call this "modified atmosphere" packaging. Another high-tech packaging technique is to wrap meat in material that absorbs oxygen or add small packets of chemicals in the package that suck it up. Packers may include *biosensors* that change color when the contents of the package is no longer safe, signaling either decomposition or a too-high bacteria count.

To slow down oxidation at home, wrap meat tightly in either heavy-weight plastic wrap or aluminum foil to store. They are both impermeable to oxygen, but the brands commonly available for household use are not particularly strong. Double-wrapped waxed butcher paper is strong, therefore good to use if you can find a ready source for it. You can combine butcher paper and another wrap for a double protection. We cannot reproduce the efficient commercial wrapping material which contains three or four layers of laminations that complement each other, each with a useful protecting characteristic. One for strength, another to be imperviousness to moisture and oxygen, and still another with a high degree of cling. Unfortunately, they are too costly for widespread retail use and they are unavailable to home cooks.

Freezing and thawing

Even though freezing is the best way to keep fresh meat wholesome over long periods of time, there are good ways to freeze and better ways to freeze. You always damage meat when you freeze it. As crystals of ice grow inside the tissue, their sharp points puncture the meat's cell walls. This damage is apparent as soon as you defrost the meat as you see a puddle that leaks out of these damaged cells. More moisture continues to leak out when you cook the meat eventually losing so much that the meat turns dry. But you can reduce freezing damage.

Slow freezing produces a smaller number of large, slow-growing ice crystals, while fast freezing is so fast that only numerous tiny crystals form. Small crystals do small damage to cells, and the defrosted meat has little moisture loss. For this reason meat packers freeze meat as quickly as possible. First they blast the meat with very cold air to reduce its temperature to 25°F (-4°C) within 80 to 120 minutes. How fast the temperature drops after that doesn't matter because the ice crystals have already formed and they remain small.

This quick rate of freezing is not possible at home, but you can imitate it. Freeze meat in a single layer on a metal baking sheet, leaving the pieces unwrapped and not touching to speed up the freezing process. Once they are frozen, consolidate them into one or several packages, wrapped tightly with as little air included as possible. The pieces don't all stick together when you individually freeze them like this, so when ready to defrost, you can take only what you need without defrosting the whole package.

You can also ice-glaze smaller pieces of meat before storing them in your freezer, a process that is as good as vacuum packaging. First freeze the individual unwrapped pieces as I suggested above. When frozen solid, dip each piece into ice water for just a few seconds till a thin glaze of ice covers the surface, then return it to freezer for a few minutes. Repeat the process several times to build a layer of glaze around the meat, then wrap it tightly. The ice glaze seals in moisture and keeps out oxygen. Food scientists have actually stored meat for six years under similar conditions with no detectable deterioration. They probably could have stored it much longer but they ran out of patience.

The highest quality frozen meat comes from cryogenic freezing. They immerse the meat in extremely cold liquified gases (liquid nitrogen or nitrous oxide). The meat freezes so rapidly

that the ice crystals remain very tiny with minimal damage to cells and tissues. A defrosted cryogenic meat is almost like fresh. The process is expensive and only high-quality meats get this special treatment.

If you have a lot of meat to freeze, buy some dry ice and put meat and dry ice together in the freezer for a fast freezing. Dry ice is available in most large towns.

How you defrost frozen meat also contributes to its final quality. Slow thawing is best because it causes the least amount of overall moisture and nutrient loss. Any moisture and lost nutrients tend to get reabsorbed as the meat thaws slowly. The only advantage of quick thawing is that the energy you use to chew the tougher meat justifies the consumption of the high-calorie dessert that follows. Defrosting meat on the counter, under running water or in the microwave are all much too fast and to be avoided.

Health safety experts warn consumers continually about not refreezing defrosted meat. If you know what you are doing, however, there is no harm in this practice. Just be careful that the defrosted meat always remains cold, you handle it hygienically and refreeze it correctly. Contrary to popular belief, thawed meat is no more susceptible to bacterial spoilage than fresh. U.S. Department of Agriculture tests showed that meat frozen and thawed three times in succession was as good as meat thawed only once, and it had just a slightly higher bacterial count. The only significant change was in moisture content because meat loses a little more moisture each time you thaw it.

TASTINGS Timetable for defrosting meat

	In refrigerator	**At room temperature**
Large roast	4-7 hrs/lb	2-3 hrs/lb
Small roast	3-5 hrs/lb	1-2 hrs/lb
1-inch (2½ cm) steaks	12-14 hours	2-4 hours

How long to keep meat in the freezer

Any guides in cookbooks and home economics text recommending maximum storage time in the freezer are very approximate. No one has conducted a thorough research on deterioration of meat in the freezer over time. The guides are probably much too conservative. Well-wrapped, properly-frozen meat in a freezer that's at least 0°F (-18°C) keeps much longer than the guide suggest, probably at least twice a long. I defrosted professionally wrapped frozen venison loins that someone lost in the freezer for 2½ years and I cooked into the most tender, moist, succulently juicy meat. Home economics guides would have suggested discarding such a meat without hesitation.

According to guides, you can keep well-wrapped beef and veal for a maximum of 12 months in your home freezer. Use up frozen pork and lamb in six months. Commercial vacuum packaging can extend shelflife for most meats to 20 months.

How fast your frozen meat deteriorates depends on the temperature of your freezer, the amount of total fat in the meat and the relative amounts of saturated fat. Check you freezer temperature and adjust it to no higher than 0°F (-18°C) to slow deterioration as much as possible.

Commercial freezing techniques have improved greatly over the last few decades, but consumers would still rather buy fresh meat, then wrap and freeze it themselves under less-than-ideal conditions. This is what many people do when some meat is on sale, and often end up

eating second-rate meat just because they found such a deal they couldn't miss. Remember that buying good quality meat when the price is reasonable makes good sense only if you know how to freeze properly.

Freezer burn

What is freezer burn? It is a combination of oxidation and dehydration caused by either poor packaging material or poor wrapping technique. Meat that becomes even partially unwrapped in the freezer is exposed to oxygen and also loses moisture that goes from ice phase directly into vapor (a process called sublimation). The desiccated, oxidized dark meat turns light and light meat turns dark. You can easily prevent freezer burn if you wrap carefully before storing.

Other ways to preserve meat

Before refrigeration and freezing became available to us, people used other techniques to store meat over longer periods:

- curing
- dehydration
- fermentation
- canning

Curing was a favorite way, probably because it gives meat the best flavor. Today we use both wet and dry curing.

Dehydration is the simplest of all meat preservation technique. Humans have used it for thousands of years, and in some parts of the world is still the major way of preserving meat and fish. Either natural heat (the sun) or dehydrators remove most of the moisture from the meat. To beat spoilage by bacteria, dehydration has to be fast and because meat dries from the outside in, it must be cut into thin strips. If the pieces are too thick, the outside hardens and the inside moisture can't escape. Trapped bacteria thrive in any remaining inside moisture and spoils the meat.

After dehydration removes most of the moisture, the original structure of the meat collapses, so dehydrated meat shrivels up like beef jerky. It retains only about 5 percent moisture, not enough for microorganisms—they require about 18 percent. Although you can replace the moisture by soaking the meat in hot water, you cannot restore the appealing look of fresh meat—reconstituted meat is not appetizing but perfectly good in stew-like dishes and soups.

The modern way to dehydrate is by freeze-drying in a vacuum. The processor first freezes the meat to stop bacteria from growing, then reduces the moisture to a mere 2 percent by sublimation (the moisture evaporates directly from ice into gas). The process accelerates in a vacuum. In freeze-drying, the meat retains its original structure and color. The texture changes since most of the moisture is gone, and the meat looks like a dry sponge. If you place freeze-dried meat in hot water for a short period of time, it sucks up water, regains its texture and structure, and looks and tastes much like fresh meat. Vacuum freeze-drying is an expensive method that yields high-quality dried meat with minimal bacteria. The most common use for meat preserved like this is in one-package back-packing meals.

Both dried and freeze-dried meats retain their original fat content, so they eventually turn rancid unless sealed in vacuum packaging or bathed in antioxidants. If mold starts to grow on the outside of dried meat, it means the surface layer was rehydrated, either from humidity in the air or because someone watered it along with the philodendron.

Fermentation is not a common way to preserve meat, but it is the process that gives that excellent, unique flavor to good-quality dry sausages and salamis.

Canning is an old established method of food preservation that goes back to the American Civil War times though canned version of meat is hardly a gourmet's delight. To make meat absolutely safe, it must go through processing at high heat for a certain length of time. What comes out of the can rarely resembles the flavor and texture of the original product. Take canned corned beef, for instance. It is not necessarily bad, but not at all like beef or even fresh-cooked corned beef.

Warmed-over flavor

Leftover meat is a bonus in any busy household, but after several days it develops a distinctive, disagreeable off-flavor that bothers some taste buds more than others. What can we do to prevent it or at least reduce its effect? Food scientists even have a term for this, they call it *warmed-over flavor*. Unfortunately, it is not a flavor that we can totally eliminate. Warmed-over flavor is the oxidation of the fats in the meat, it is the first sign of it turning rancid. This is the same chemical process I discussed above under Preserving Quality. Heating releases compounds in the meat that not only promote but accelerate the oxidation. When cooking in metal pots, the released metal ions accelerate the process even further. As with chemical reactions in general, this reaction also slows down at lower temperatures and if you can cut off oxygen from meat, you can reduce oxidation completely. So do the obvious. Wrap any leftovers carefully to cut off oxygen and store them in the refrigerator or freezer as soon as they are cool enough.

Covering the meat with a sauce to keep oxygen away is an excellent way to reduce rancidity. (It doesn't completely eliminate oxidation because the sauce contains some oxygen.) Meat stored in gravy has a shelflife five times longer than meat wrapped securely by itself. Meat high in unsaturated fat is particularly susceptible to this type of rancidity, and so are breaded cooked meats as the rough surface of the breading holds a lot of oxygen in its porous texture no matter how tightly you wrap it. Meat processors add an antioxidant (*ascorbic* acid) to cooked meats to inhibit development of warmed-over flavor. Antioxidants are harmless and don't effect the flavor.

At the normal refrigeration temperature of 38° to 40°F (3° to 4°C), warmed-over flavor develops within two days. Reheating the meat and raising the temperature again speeds up oxidation. To enjoy leftover meat, eat it cold and within a day or two of the original cooking.

Sausages and other processed meats

Processing meat started as a method to use all extra parts of the animal, particularly those that tend to spoil quickly. Different regions and ethnic groups added their own unique spice mixes, their own special preparation technique until today we have a truly stunning variety of sausages and other processed meats worldwide. Processed meats turned out to be a superb way of using those extras, plus, they are also easy to prepare and eat, and are relatively inexpensive. A well-spiced, well-cured processed meat has excellent flavor, which is another reason they are

so highly sought in every culture. Sausage is merely processed meat stuffed into casings.

The term sausage comes from the Latin *salsus*, which means meat preserved by salting. We have five general types of sausages:

- **Fresh sausages**, such as breakfast pork links and bratwurst, are uncured, well-seasoned ground meat blends. They are very perishable.
- **Cooked sausages**, like liver sausage and braunschweiger, are also well-seasoned ground meat blends, but they are cooked. They can be either cured or uncured and can include smoke flavors, but they are not smoked. They are moderately perishable.
- **Uncooked smoked sausages** are either cured or uncured, but they are always smoked. The cured ones, like Polish kielbasa, are ready to eat. The uncured ones, like smoked bratwurst, need to be cooked before eating. They are not very perishable.
- **Cooked and smoked sausages**, for example frankfurters and bologna are cured products that are ready to eat cold. They are moderately perishable, or, if heavily smoked, only slightly perishable.
- **Dry and semi-dry sausages** are not only cured and smoked but fermented as well. Good examples are pepperoni, salami and summer sausage. They are best eaten cold. When lightly cured and smoked, they are moderately perishable, if thoroughly cured and smoked, they are not perishable.

Sausage is a highly processed food. They always include chemicals to enhance flavor, retain color and keep from spoilage and rancidity. The cost and quality of sausages vary far more than most other meats. Both cost and quality depend on what ingredients went into that meat and how long processing took. The type of principal meat ingredient determines the texture, flavor, juiciness and mouthfeel. The principal meat ingredient is often meat by-product. These are not poor-quality meats but trimmings or other parts that the processor can't readily market on their own (there is no ready market, for example, for pork snouts or cow lips). That helps to keep the cost down.

TASTINGS What's in your sausage.

Government agencies have strict regulations in the U.S. and Canada what processors are allowed in sausages. Fat is limited to 30 percent in the cooked kinds, 50 percent in fresh sausages. Water cannot be more than 60 percent (this includes water contained in the meat). Usually it is between 45 and 60 percent. In cooked sausages the maximum water allowed is four times the weight of the total protein plus 10 percent. The type of meat ingredient is also regulated. You probably would prefer not to know exact ingredients spelled out on the label, but everything that goes into sausage is wholesome and edible, though may sound weird.

Besides meat, sausages include many other ingredients. These include binders that combine with the water and fat so that the sausage is firm and won't crumble on slicing. Fillers fill extra space that's left over after they add the meat, fat, water and binder. These are inexpensive food ingredients such as cereals, starches and milk proteins. Then comes a long list of flavorings, flavor enhancers, curing agents, sweeteners, antioxidants and preservatives. If you are really curious, look at the ingredient label on a cured sausage. But I don't recommend this if you want to continue enjoying sausages.

It is true that sausages, no matter what kind, contain a lot of fat. If the amount is less than

30 percent, the sausage becomes tough and rubbery. Food scientists have been working with some success on low-fat, or at least lower-fat, sausages using ingredients that give the mouthfeel of juiciness, a major function of fats in sausage. They have managed to reduce the fat content to 10 percent and maintain the texture while retaining surprisingly good flavor.

Meat curing

Meat curing is an ancient cherished art and tradition. Meat curers learned early on that the potassium compounds (which occur as impurities in natural salt), produce characteristic taste and color, and even act as preservers. Refrigerators in every household halted the need for preserving meat this way, but curing remains popular—the potassium compounds preserve both color and flavor wonderfully well.

There are two basic techniques for curing—wet and dry. Both are ancient techniques, and both are still in use today. In dry curing, the sausage maker rubs the dry ingredients all over the surface of the meat. Their flavors slowly penetrate and diffuse, aided by the moisture of the meat itself. At refrigeration temperature, this type of curing takes approximately 24 hours for every pound (half a kilo) of meat. Then they wash off the curing substance and store the meat under refrigeration for 20 to 40 days to allow the curing salts to seep thoroughly and uniformly throughout.

The next step is the slow drying process under controlled temperature (57° to 68°F or 14° to 20°C) and high humidity, which lasts anywhere from 6 to 12 months. During this period complex series of biochemical reactions develop that culminates in a characteristic flavor specific for the type of cured meat. Examples are German Westphalian, Italian Parma or prosciutto, Spanish Serrano or American Virginia or Smithfield hams. The process is slow and storage space is costly, so end products are much pricier than uncured or quick-cured meats.

Smoking hams or other meat is also an ancient method of preservation. Humans learned and enjoyed the result of the smoking process since they conquered fire. Smoking with hot smoke preserves meat as the heat destroys microorganisms. However, cold smoking, another commonly used method, also preserves meat if certain wood is used in the process. Some wood contains chemicals call *wood tars* that destroy bacteria and fungi. During the smoking process the wood tars condense on the meat surface and sterilize it. Smoked meat with wood tars are safe from spoilage even if stored at room temperature.

TASTINGS How Egyptians preserved mummies

Egyptian preserved their mummies for thousands of years the same way as smoking preserves hams, using wood tars. Instead of smoking the bodies, they rubbed them with wood tars but it is not yet clear how they managed to obtain these chemicals.

For sausages, the curing process is much simpler. The sausage maker mixes both the curing substance and the sausage ingredients, then stuffs the mix into casings. The uncured sausages go directly into a room-temperature drying chamber to ripen for two days. Microorganisms from the air can develop flavor in a short time because the ground-up meat offers them a large surface area to work on. A storage period of ripening follows that lasts from 20 to 90 days at somewhat cooler temperatures. This reduces moisture, eliminates any pathogenic organisms and allows the protein to coagulate, that, in turn, gives the product its

characteristic texture and flavor—whether pepperoni, salami or chorizo.

Wet curing is a modern technique invented to drastically reduce curing time. Quality usually suffers, but the price drops significantly. The curing ingredients are the same in both techniques, but in the wet method the processor dissolves them in water to produce a spicy brine. Smaller pieces of meat, like tongue or brisket, go directly in the flavored brine to soak up the flavors. Larger pieces, like ham or bacon, get their brining solution through injection needles, like we get shots in our rumps. An elegant curing method is injecting flavored brine through the still existing artery system in the meat. The curer finds the vein system, connects a needle and injects the brine solution that quickly and efficiently surges through the original vein system. As a customer you have no way to tell from retail labels what type of wet curing they used on the piece you are about to buy.

Wet curing is faster, but it still takes weeks. Modern technology has now developed an even faster process that only takes days and shaves the processors' cost, the products' price and, not least significant, the quality of the end result. Someone came up with the brilliant idea to tumble the meat with the flavorings, brine and chemicals in huge drums. It is cured and ready to be packaged in a day or two, instead of weeks. A speedy process resulting in a product of low quality.

Tender, juicy meat with brining

How does brining work? When we have a solid meat in a brining solution, salt and flavorings move from the high concentration in the solution into the meat, like water always running down-hill. This is a slow but steady process. The meat becomes salty in the process. Salt does two things—it improves flavor as it naturally enhances any flavor, but it also preserves the meat. Microorganisms that spoil meat cannot live in a salty environment. But it has one more role. Salt is hygroscopic, i.e. it holds onto water. In this role salt particles within the meat retain moisture thus the cooked meat remains juicy, tender.

You can also use salt to cook the most tender roasts and poultry. Many cookbooks suggests to heavily salt meat or poultry and let it stand in salt for an hour or two before cooking. Another method is to let meat or poultry soak in heavy brine solution pregnant with flavorings. In both cases salt has the same role—to enhance flavors and to retain moisture in the meat or poultry. When the brine includes flavorings, both salt and flavors penetrate the meat.

Most brining solutions also include a little sugar. Sugar has a very similar role to salt. A small amount further enhances flavor, but sugar also retains water though not as powerfully as salt. The salt and sugar together make the most tender, most succulent, juicy meat and poultry possible.

Bacon

Top quality bacons are the result of both curing and smoking. Its lower-priced cousins do not get such treats. Instead of smoking, the processor injects a brine solution with artificial smoke flavorings into the pork belly and within hours the bacon may be legally label as cured and smoked. You don’t get the benefit of smoking but the illusion is there. Medium-priced bacons get a treatment in-between the two extremes. After injection of brine, the bacon is smoked in a real smoker.

What about the bacon sizzle in your frying pan? Why some sizzle a lot, others just a

little? The meat retains a lot of water from the brine bath. It gains weight that is all gain in water. As soon as the bacon is hot enough on the griddle for the water to vaporize, the steam escapes from under a layer of fat. As the thousands of tiny bubbles of steam pop, you hear the distinctive bacon sizzle and smell a mouthwatering aroma. Once the bacon loses all the moisture and much of the fat, it shrinks to a fraction of its original size. It also becomes stiff because there is no more moisture to make it supple. Better-quality bacon with less water gives gentle, more friendly sizzle.

There is also dry-cured bacon, an expensive first cousin of our common bacon. You won't find it in supermarkets, and certainly not at supermarket prices. Because of its low moisture content, a truly dry-cured bacon is so stable that it doesn't even need refrigeration. Look for them in gourmet meat markets.

Fermented sausage

Some sausages, like dry salami and pepperoni, are actually fermented by *Lactobacillus*, a close relative of the bacteria that ferment yogurt and sour cream. This fermentation raises acidity of the meat by producing lactic acid (just like in yogurt and sour cream). The environment eventually becomes too acidic for harmful microorganisms. To prevent the meat to turn rancid, the processor adds antioxidants. Combining this fermentation with partial dehydration, the sausage becomes stable at room temperature, like the dry salamis and sausages you see hanging from hooks in the meat department. Fermented sausages and meats are not smoked.

Are cured meats safe?

People have been eating fermented, cured and smoked meat products for thousands of years without the danger of getting sick. So we haven't given a thought to their safety until the December 1994 outbreak of poisoning from salami in the states of Washington and California. This incident was a complete surprise even to microbiologists and food scientists. Microorganisms don't normally grow in the acid environment of salami, but unfortunately, a new strain of a common bacteria, *Escherichia coli*, is able to survive in a high-acid environment. Heat kills the bacteria, but we eat these dry-cured products raw. Heat triggers chemical changes that adversely affect their flavor. Meat processors and food scientists are now attempting to come up with a way of eliminating this new strain of bacteria without cooking the meat.

TASTINGS Moldy salami?
Fermentation usually takes place inside the meat, but there are some raw sausages and salamis that are mold-fermented from the outside. The molds grow on the surface and give a distinctive flavor and appearance, like the mold in blue cheeses and brie, that penetrate and impregnate throughout. Until relatively recently, these mold-covered products were illegal in the U.S., until the U.S. Department of Agriculture relaxed these regulations and declared them safe.

Restructured meat

Finally, I want to introduce to you a type of meat that is a newcomer, the highly processed restructured meats. The most familiar of these are ham and turkey breast lunch meats.

How do they make these? The meat processing plant has plenty of trimmings and tough, connective-tissue-rich meats that are not much good for anything but dog and cat food. But people food fetches a higher price, so the processors grind up, flake or chop and finally restructure them into a shape that's easy to handle and slice. Of course, they add many other things like binders, conditioners, preservatives, salt and flavorings before cooking and shaping. Consumers recognize their shapes, even their textures as ham, turkey breast, roast or steak but not their flavor. Low prices more than compensate for the change in flavor for many consumers.

Meat in the Kitchen

When it comes to preparing meat, a cook's major goal is tenderness, juiciness and flavor. To consistently turn out the best meat, it helps to have a basic insight of what happens to meat when you heat it. Cooking experience over your stove also helps.

From earlier discussion you know a little about muscle tissues, connective tissues and fat. These three determine potential tenderness as well as flavor.

The amount and kind of connective tissue surrounding the meat is the most difficult to deal with in the kitchen, and it affects tenderness the most. Some meat, like flank steak, has a lot of connective tissue reinforcement, so it is almost as tough as tires. Most of it is collagen, which fortunately converts to soft gelatin through slow cooking. Elastin and reticulin, the other connective tissues are less common, fortunately for us, because these remain tough no matter how long you cook them.

TASTINGS Tenderness to a professional palate

Professional food tasters use three criteria to assess meat tenderness:
a) the ease with which their teeth sink into the meat,
b) the ease with which their teeth break up the meat into fragments,
c) the residue left in their mouth after chewing.

The water-holding capacity of meat has an impact on tenderness, too. The more water it retains in cooking, the juicier the meat is on your plate. Some meats have better water retention qualities than others, and some cooking methods promote water retention more than others. Juiciness is actually a combination of the amount of fat and moisture, up to a certain point. Chewing on a fatty meat with little moisture, for example, doesn't give the same pleasant sensation that chewing juicy meat does. What brining of the meat, that I discussed above, does is to increase its moisture content.

Tenderness and juiciness are somewhat related. A tender meat is usually also juicy, but a juicy meat may not be tender. No matter how juicy a piece of brisket is, if it is full of tough connective tissues, it won't be very tender.

Unless you're willing to eat your meat raw and cold, you're going to lose some moisture in the preparation in almost any cooking method. As soon as you apply heat, moisture begins to evaporate from the surface. The muscle fibers respond and slowly contract releasing even more moisture. When you are broiling and grilling, you lose the least moisture because the cooking process is so rapid, but the lost juices are gone for good. While you lose much more moisture in roasting, some of those juices, along with their flavor and nutrients, become part of the gravy or sauce. One of your goals, no matter what your cooking technique is, to preserve as much of the original part of the meat as possible.

Choosing the right cooking method

Here are three important things to remember in meat cooking:

1. Most of the tough connective tissue slowly converts into soft gelatin with heat. But as the meat temperature first begins to rise, connective tissue shrinks and becomes even tougher. It shrinks a great deal between 140° and 167°F (60° and 75°C). It only begins to convert into soft gelatin near the boiling temperature of water, at or above 200°F (94°C). Any tough meat has to come up to this temperature before it becomes tender.

2. When you heat meat, the meat fibers toughen. The softest, most tender meat is raw meat. The higher the meat temperature you reach, the tougher the meat fibers are. If you want to know more on the microscopic scale, here is what happens. The tightly coiled peptide chains (the main protein components of meat tissues), start unfolding on heating. Eventually, these unfolded chains join to each other to form larger and larger aggregates. They finally reach such a large size that they can no longer remain in solution and precipitate. This process, called *coagulation*, occurs somewhere between 135° and 167°F (57° and 75°C). The more coagulation, the tougher the fibers become. You can actually see this happening—the meat turns from translucent to opaque.

3. The browning (or Maillard) reaction adds significantly to the flavor of meat (see discussion below).

To get the maximum tenderness from meat, we have to make serious compromises on the differing cooking needs of the connective tissue and meat fibers. If we raise the temperature of the meat too high, we end up with fully softened connective tissues and fully toughened meat fibers. At too low a temperature, just the opposite happens: tough connective tissues and tender fibers. Meat research scientists have found that the best compromise for handling these two opposites is to cook the meat to an internal temperature between 140° and 147°F (60° and 64°C). If you're cooking meat that's tender to start with, a tenderloin, for example, your major concern is to keep the fibers from toughening, which means you can remove it from the heat at a lower internal temperature. You need not worry about the small amount of connective tissue—tender cuts have very little.

What grade the inspector assigned to your piece of meat also has consequences on the final flavor and tenderness. The correct final internal temperature is particularly critical with lower grade meats. Research has shown that Choice grade beef keeps its flavor intensity even if overcooked, though overcooking toughens it. The lower Select grade beef loses its flavor under the same conditions and turns even tougher than Choice grade. But remember this crucial point: **The final internal temperature has more effect on tenderness than either the age of the meat or its marbling**. That's why a *good* meat thermometer is so important. A good cook is never without a good thermometer.

So how do restaurant chefs and line cooks in a steak house know when the meat is done? Do they poke a thermometer into each piece of meat to make sure? No, they don't have the time to do that (those so-called "instant" thermometers take close to half a minute to give their readings). Having experience they can tell by feel what stage of cooking that meat has reached. If you trail a line cook and poke a thermometer in every steak just off the grill, you'd find the internal temperature of each is within a few degrees of what it is supposed to be. And when you start broiling 40 to 50 steaks per hour on a regular basis, you can quit using the thermometer, too.

Cooking triggers a series of chemical reactions between proteins and other lesser

components to develop flavor. Raw meat is bland, almost flavorless. Both the method of cooking and browning are keys to great flavor. Any browned meat has more flavor than unbrowned meat. In fact, any food develops more flavor when heated to a high temperature—fruits, vegetables, sugar, bread crust in the oven, even soup bones for stock. This is thanks to the browning reaction.

The browning reaction

Maillard, a French chemist, in 1912 heated sugar (as glucose) and glycerine (a sweet syrupy alcohol) and produced a strong meat flavor, even though there was no meat in the mixture. He called this the *browning reaction,* and today it is also referred to as *Maillard reaction*.

The flavor that we recognize as meat flavor develops through this reaction between 104° and 122°F (40° and 50°C) from chemical reactions between protein (amino acids) and available sugar in the meat. If you continue heating the meat, the sugar also caramelizes, a process that initiates another long chain of chemical reactions with many more flavor products that become part of the complex meat flavor.

> **TASTINGS Boiled versus roasted meat.**
> In a comparison study of beef, food scientists prepared two identical cuts in a food laboratory. They boiled the first piece and roasted the second. Before they taste-tested (an eventually devoured) the meat, they gave both pieces to their technicians to analyze all the volatile aroma compounds in each piece. The technicians found a mere 94 in the boiled cut, but 287 in the roasted piece. This large difference accounts for the far superior flavor of browned meat. It takes time for the aroma compounds to develop. That's one reason why microwave cooking is inferior to oven roasting. It is too fast and lacks the intense heat that develops the flavors of the browning reaction. The same is true for most cooking and baking projects in the kitchen—speed sacrifices flavor.

Safety

The meat from a healthy animal is sterile. Bacterial contamination comes from outside the animal and often from the hands of meat workers. Today's meat processing plants are not only extremely efficient but nearly as sterile as a hospital operating room, with the utmost care to avoid contamination. Of course, it is not possible to completely eliminate some bacterial contamination, as it is not possible in an operating room. But even if some bacteria is present, a healthy person’s body has no problem to fight off an occasional light bacterial contamination, whether it is from meat, unwashed fruit, ice cream from a street vendor or water at the drinking fountain.

American and Canadian consumers felt impervious to meat contamination because of meticulous inspection by the meat industry. We considered our meat to be the safest in the world and didn't hesitate to barbecue hamburgers and steaks rare, even so rare that the internal temperature barely registered lukewarm and the color remained pinkish-red. These temperatures, of course, are the favorite breeding grounds for any organism, micro or macro.

An outbreak of food poisoning in the Seattle, Washington area in January 1993 surprised

health officials, meat inspectors and even food scientists. Ground beef patties from a fast-food restaurant, cooked to the usual stage of medium, made dozens of people sick. Scientists quickly traced the outbreak to a strain of the common and generally benign bacteria, *Escherichia coli* (*E. coli* for short). This bacteria occurs in soil, on plants, in water and on all herd animals, and it has rarely been a problem in food safety. A relatively new strain, however (called O157:H7), that scientists knew back in 1975, can harbor a virus which produces one of the most potent toxins (called *cytotoxins* since it poisons our cells) known to humankind. The Seattle hamburgers contained this new strains of E. coli. This tough strain can even survive freezing temperatures. Heating the meat to 160°F (72°C) is the only safe way to destroy it. Not only is the toxin highly potent but people who ate contaminated meat can pass it on to others by touch. Two of the four children who died from that outbreak in Seattle hadn't even eaten the contaminated hamburgers but caught it from others who had.

Since the Seattle outbreak, cleanliness is even more strictly enforced in slaughterhouses and meat processing facilities. In fact, a federal inspection agency introduced a zero-contamination standard which guarantees at least hospital-level conditions in meat packing plants. This is comforting to us, yet we still need a new level of safety in our kitchens, too.

Preventing *E. coli*

Is there any alternative to a well-done meat to avoid *E. coli* toxin? No one has come up with an answer yet. To be absolutely safe, restaurants now bring the internal temperature, measured in the center of the meat with a reliable thermometer, to 160°F (72°C). The problem is that meat starts to dry out before it gets to that temperature. At home you can cook the meat until the internal temperature reaches 155°F (69°C) and still be safe, but food safety experts also consider the meat perfectly safe by holding it at 145°F (63°C) for at least four minutes. At this lower temperature the meat is still medium-done, reasonably juicy and tender.

Remember, too, that ground meat is particularly susceptible because of its large total surface area. Ground meat also goes through several extra processing steps, each one offering another chance for contamination from machinery or workers' hands. A whole piece of meat runs much less risk of contamination. If it came from a healthy animal and there are no gashes through which bacteria can enter, the inside of a chunk of meat is sterile. It doesn't matter if there is contamination on the outside because any cooking method is hot enough to destroy those surface microorganisms.

But you can have safe hamburger cooked to medium rare. Choose a large cut of meat and drop it into boiling water for 10 seconds to sterilize the surface, then grind it in a clean meat grinder or food processor. Your hamburger will be free of contamination and safe to eat no matter how rare you like it.

What about pork? Pigs are considered filthy creatures, but that reputation is only skin deep. Besides bacteria, pork can carry *trichinosis*, a parasite that you catch if you eat improperly cooked pork. Trichinosis used to be very common in pork but not so any more thanks to far better western animal husbandry. Even though it is very uncommon (incidence is less than 0.1 percent in the U.S. according to the U.S. Department of Agriculture, which is one pig in a 1000), to guard yourself and your dinner guests against it, you need only raise the internal temperature of any piece of pork to 137°F (58°C).

Common knowledge of trichinosis is widespread, and most people know not to serve pork rare or even medium rare. In fact, many cooks are so afraid of the infection that they

overcook pork, which makes it dry and tough, though fortunately still flavorful. Use an accurate, meat thermometer to make sure you are serving a safe pork. The Pork Institute recommends that you cook pork to 145° to 150°F (63° to 66°C). Stay at the low end of this scale for the juiciest, most tender pork that's still absolutely safe.

Guide to preparing

Finally we get to the meat of this chapter, how to cook meat to perfection. The only two essential tools you need are an accurate meat thermometer and sharp knife.

The thermometer gives you the power of full quality control for the best and perfectly safe meat. Have a good meat thermometer with a thin stem that pierces the meat as little as possible to minimize moisture loss. Whether it is digital or not doesn't matter, though I find that the battery of a digital thermometer will invariably die at the most critical time. Even if you keep a spare battery, by the time you fiddle around replacing it, the fillet mignon on the barbecue turns from medium rare to over the well done stage, a calamity.

With digital thermometer you only need to insert the very tip of the stem. With the old-fashioned analog thermometer a three-finger-wide tip must be in the meat to get and accurate reading. When measuring the temperature of a thin piece of meat, it is best to prewarm the stem. Otherwise when you insert the cold metal stem, the meat can cool down several degrees around the thermometer stem and you may get a too-low reading.

To measure the temperature of a thin piece of meat, insert the tip horizontally from the side or end of the meat.

Your second tool, a good sharp knife makes any cutting job much easier and gives you full cutting control. A good knife is not necessarily expensive, but cheap knives are not good knives. What's important is how it fits in your hand. Many professional cooks use modest-priced knives, which they keep razor-sharp at all times. Real pros don't let anyone else touch their knives, and many nonprofessional cooks do the same.

If your knife takes part in a lot of action in your kitchen, use a honing steel frequently, and always at the beginning of each major cutting job. This doesn't actually sharpen the edge but realigns the steel. Keep the knife sharp with the occasional use of a sharpening stone, a steel file, an electric sharpener or whatever sharpening device you received as a wedding gift.

Cooking Methods

There are only two basic methods to cook meat—with dry heat or moist heat. Which method you use depends on the type of meat and your personal preference. If the meat has fine texture (soft, small fibers) and minimal connective tissues, dry heat gives the best result, if not overcooked.

Meat that contains coarse fibers and more connective tissue turns out best in slow, moist heat so the tough collagen has a chance to turn into soft gelatin. Some cuts are suitable with either cooking method.

Dry heat cooking

The five types of dry heat cooking are:

♦ grilling (barbecuing), broiling or pan-broiling

- sautéing
- deep-frying
- stir-frying
- roasting (baking)

Dry heat cooking methods use high heat and little moisture. Cooking is not entirely dry, as the name implies, because all meat have plenty of moisture that contributes to the cooking process. Since extra moisture is not welcome because it reduces the high cooking temperature, it is always a good idea to wipe the seafood thoroughly with a paper towel just before cooking or, if fried with breading, before applying the coating.

The hottest heat in dry cooking method is grilling (barbecuing) and broiling. To avoid sticking, brush the surface of the grill or broiler pan with a film of oil, and for added insurance, do the same with the meat. The intense heat (with some help from the brushed-on oil) rapidly browns the surface of your meat. By the time you cook the inside, the surface color is a deep caramel brown or, if you're not careful, charcoal black.

Never turn the meat more than once either on the grill or under the broiler. This keeps handling to a minimum and produces attractive grill marks. Determine the time to cook one side, set your timer and don't even peek until the time is up. Quickly flip the piece over and set the timer again. Now you can get ready to check the internal temperature.

When you are grilling smaller pieces, skewer them. Keep heavy work gloves near the grill to turn skewered meat.

A quick and easy way of cooking meat is pan-broiling, which is similar to grilling or broiling. To pan-broil meat, place it in a heavy preheated skillet over medium heat. Cook the meat directly on the hot surface without water or oil, turning only once. This is an excellent way for preparing steaks and ground meat patties. Some cooks sprinkle salt in the pan before adding the meat to prevent sticking. Initially the meat may stick a little, but if you detach it from the pan right away, the fat and juices from the meat keep it from sticking again.

Thai marinated skewered pork tenderloin grilled with two peppers

Southeast Asian cuisines produce magic with just a few ingredients in the right combination and correct amounts. Thai cuisine has been particularly popular in the U.S. since the early 1990s. Why Thai was picked from the several other similar and equally wonderful Asian cuisines is a mystery. Indonesian, Malaysian and Vietnamese dishes are also marvelous, yet fashionable chefs neglect them in favor of Thai.

The basic marinade in this recipe works equally well with poultry or beef, too. The soy sauce is too strong to be suitable for fish, except perhaps those with the strongest flavors. The ingredients of the marinade suggest mainly oriental ancestry with Worcestershire sauce as the British influence.

I recommend pork tenderloin, the leanest of all pork cuts, for this dish, though you may substitute other lean pork.

Ingredients

1½ pounds (680 g) pork tenderloin, trimmed, cut into 1-inch (2½ cm) cubes
1 large red pepper, cut into 1½-inch (4 cm) squares

1 large green pepper, cut into 1½-inch (4 cm) squares
Skewers

Marinade (1½ cups)
1 cup soy sauce
1 tablespoon sesame oil
1 tablespoon lime juice
1 teaspoon Worcestershire sauce
¼ cup bourbon or brandy
2 tablespoons brown sugar
1 tablespoon ginger, minced
2 cloves garlic, minced
1 tablespoon parsley, chopped

To Assemble

1. Mix all ingredients of the marinade in a medium-sized non-corrosive bowl and stir until sugar is completely dissolved.
2. Pour marinade over the pork cubes and marinate for 4 to 8 hours, stirring occasionally to redistribute the marinade.
3. If you are using bamboo skewers, soak them in water for 30 minutes to prevent burning.
4. Fill skewers with alternate pieces of pork, red pepper, pork, green pepper until skewers are full. If you assemble them ahead of time, refrigerate.
5. Grill over hot fire or under broiler for 8 to 10 minutes, turning once, until the meat turns caramel brown. Watch carefully that it doesn't burn; the brown sugar in the marinade caramelizes quickly.

Serve at once. They are best fresh off the grill. Serve over rice with grilled or sautéed vegetables. Let your guests pick the grilled food off the skewers.

Serves 4 as main meal, 16 as finger food.

Sautéing, deep-frying and stir-frying all use oil. Sauté meat in small amount of fat on strong heat. Sautéing is easy, not messy, very quick and the meat absorbs a minimum of fat. Keep the pan in constant motion for even browning and to avoid sticking. If you are planning to serve the meat with a sauce, you can use what's left in the pan as a base—the highly-flavored oil with some deeply-browned food particles and possibly some juice. Deglaze it by adding a little wine or stock, even water. The liquid dissolves the particles and within a minute you have it cooked down into a sauce.

Deep-frying and stir-frying are both high-heat methods. The difference is in the amount of oil you use—plenty for deep-frying, just enough to cover the bottom of the pan or wok for stir-frying. Food absorbs more fat in deep-frying than in any other cooking method, but if you do it properly, you can reduce fat absorption. Deep-fried food of any kind is wonderful but home deep-frying is messy.

If you decide to deep-fry, you must bread the meat, cover them in a batter or at least flour them well to absorb any surface moisture before you submerge them in hot oil. Any moisture not only makes a terrible, messy spatter, but reduces oil temperature and at lower temperature the

meat absorbs more oil.

In the hot oil the moisture that moves outward from the center of the meat turns into steam near the hot surface that exerts an outward pressure to keep the oil out of the food. The sizzling you hear is the steam escaping through the hot oil bath. More moisture from the inside moves outward continuously, turns to steam near the surface of the food and continues to keep the oil out. If the oil temperature drops suddenly, steam production slows down and the oil can seep into the food. This happens if you either don’t use plenty of oil, add too many pieces into the oil at once or the food is too moist. Too hot oil is bad, too. The outside of the food browns too fast and inside remains partially cooked.

The ideal frying temperature must be close to 375°F (192°C). To fry small or thin pieces of meat, you can heat it a little higher, but for larger pieces set it between 350°F to 365°F (178°C to 186°C) so you won't burn the outside before the inside is done.

Choose a neutral-flavored vegetable oil with a high smoking point for frying or deep-frying. Almost any salad oil works well except olive oil which has too low smoking point (even though some recipes recommend it). If you don't have a deep-fryer, heat up enough oil in a large, heavy pot, so you can totally submerge the food without any piece touching the bottom. Keep track of the temperature as you are heating the oil, and as soon as it hits the mark, gently slip the meat, one at a time, being prepared to quickly cover the pot with a splash screen in case the oil spatters. Even better, use a frying basket if you have one, that you can momentarily lift out to avoid a mess. Oil only spatters for the first few seconds while the excess moisture generates plenty of steam, then it subsides. Keep adding a few pieces at a time to maintain the temperature and deep-fry until the meat is well-browned, then remove the pieces with a slotted spoon and set them on paper towels to absorb excess oil.

Fresh oil is best for frying though many chefs claim that oil they have used more than once fries foods better. To save the used frying oil, let it cool and filter through a cheese cloth or paper filter. Store it in a closed container with as little air as possible to reduce oxidation (oxygen turns it rancid). Keeping it in the refrigerator also helps. Once you heated oil, it requires more care than fresh oil—it oxidizes faster and it deteriorates a little after each use. The smoking point lowers and the surface tension decreases, allowing it to seep into your food more readily. You can slow this process of deterioration if you blend fresh oil into to the used oil next time you use it.

Stir-frying is a time-honored, quick Oriental method, now popular in the West, that uses very little oil. It is an excellent cooking method for tender meats. Stir-fried food develops superb flavor, because it works so fast. You need the highest heat you can generate and shortest time possible (novice cooks often stir-fry too long—they cannot believe any food can cook so quickly). A heavy wok over a burner that can provide intense heat is ideal. Neither a light-weight wok nor and electric wok work as well. Having not enough heat on your burner can also be a problem.

To stir-fry, have all ingredients and all equipment at your fingertips before you begin. Then heat the wok until very hot. Add just a smear of oil, then the food and toss and turn continuously until the food browns on the outside. It doesn't take more than a few minutes. Contact with the hot metal surface transforms food faster than any other method except a blowtorch.

Roasting, the last dry cooking method, is relatively slow because the heat is only moderate and is transferred to the food through air, which is a poor heat conductor. Preheat the oven before putting the food in and keep checking the food temperature to avoid overcooking.

The slow cooking produces tender, juicy meat and roasting is only suitable for large pieces of meat. Remove the meat from the oven when the internal temperature reaches about 5º lower than the final target temperature because the higher outside heat continues to raise the inside temperature for another 10 or 15 minutes.

Moist cooking

In moist methods the idea is slow and long cooking until the meat turns perfectly tender but not falling apart.

Braising (also called pot-roasting) and stewing are very similar cooking methods. In braising you add very little liquid, just enough to keep it from sticking. In a covered pan you basically steam the meat at a low heat that barely simmers the liquid. Stewing, on the other hand, uses highly-flavored liquid that covers the meat and the liquid also becomes the sauce. Good-flavored cooking liquid is essential for an outstanding stew. The slow cooking equalizes flavors—the meat absorbs some from the liquid and the liquid, in turn, acquires a pleasant meat flavor. The slow cooking also insures very tender meat. Overcooking is not a problem, unless you cook it so long that the meat falls apart.

Steaming is a moist-cooking method that is not used for meat—it doesn't develop any flavor.

Poaching (or boiling) is slow cooking in a barely-simmering highly-flavored liquid that should just cover a large piece of meat. It is not a widely-used method for meat but poaching produces wonderful meals from such full-flavored meats as beef brisket.

Cardamom-apple pork simmer

Do you like to prepare in advance? In today's rushed life style having extra food in the refrigerator or freezer is like money in the bank. Here is a stew that not only holds very well, but benefits from waiting a day for your diners. On standing, the spices infiltrate the apple and pork, and the flavors marry. Prepare extra for a second meal. This dish holds well in the refrigerator for 3 or 4 days and in the freezer for 5 to 6 months if there is enough sauce to cover the meat and insulate it from the damaging oxygen.

Inexpensive, lean, flavorful pork is best for this dish. Buy a boneless pork roast of the weight you need, trim off the fat and cut it into cubes yourself instead of buying precut meat. You'll have fresher, better quality and leaner meat at a lower price. With a good knife it only takes 5 minutes to trim and cube a boneless roast.

Ingredients

1½ tablespoons vegetable oil
1½ pounds (680 g) lean pork, cut into 1-inch (2½-cm) cubes
6 ounces (170 g) meat or vegetable broth
¾ teaspoon salt
½ teaspoon black pepper
1 teaspoon ground cardamom
¼ teaspoon cinnamon
¼ teaspoon turmeric

¼ cup brown sugar
2 tablespoons cornstarch
3 tablespoons Worcestershire sauce
¼ cup water
8 ounces (225 g) (1½ cups) tart cooking apples, peeled, cored, quartered and cut into thin wedges
1/3 cup raisins
1 tablespoon lemon juice

Procedure

1. Dry pork cubes thoroughly on paper towel. Heat oil in heavy 2 or 3-quart pan over medium-high heat and brown meat cubes, stirring constantly.

2. When the meat is brown and begins to release juices, add broth, bring the liquid to low simmer, then reduce heat to low and stir in salt, black pepper, cardamom, cinnamon and turmeric. Simmer covered for 45 minutes, checking occasionally for moisture level.

3. In a small bowl combine brown sugar and cornstarch with Worcestershire sauce and water. Add to the stew and continue simmering for 2 minutes until cornstarch begins to thicken the liquid. (If it appears too thick, add a little more water).

4. Add apple wedges and raisins and cook slowly stirring often for 2 to 6 minutes (some apples cook faster than others) until apples turn translucent and soft but not mushy (test with a fork). Stir in lemon juice.

This simmer is best if you serve it over noodles or rice with extra sauce on the side and fresh-cooked green vegetables or sautéed red cabbage.

Serves 4.

How rapidly meat heats up during cooking affects the final result, too. In moist heat cooking, the meat should heat up slowly, so the collagen converts gradually into gelatin over a fairly long time and the meat fibers toughen minimally. Slow heating also reduces loss of flavor-rich meat juices.

Remember, too that browning meat first in all moist cooking method is essential. The difference in flavor is worth both the extra trouble and the extra mess to clean up. Virtually all good meat recipe using moist cooking instructs you to brown the meat first and that is a step you cannot skip. Many recipes suggest to dredge the meat with flour before browning. The purpose of this dredging is to keep the meat surface dry. If you thoroughly dry the meat before putting in the pan, you can skip the flour.

TASTINGS Is smoking dangerous to your health?

The danger that grilled, well-browned meat (the way it is best) may contain carcinogenic compounds was only demonstrated in the mid-1990's through animal studies. At high temperature foods that contain amino acids (proteins), natural sugars and a chemical compound called creatinine convert to 17 compounds named HCAs (heterocyclic amines). These foods are mainly our muscle meats, but also vegetables and grains to lesser extent. Scientists never showed that HCAs effect people but we should be cautious with grilling, broiling

or roasting meat at high temperatures. They think HCAs appear predominantly in charred, blackened meat, that happens when you let meat juices and fat burn in the fire. They are probably not dangerous if you eat them in moderation. These scientists also believe that marinating meat, poultry and fish reduces HCAs.

TASTINGS Guidelines for final internal meat temperatures

Doneness	Meat temperature	Meat color
medium-rare	145°F (63°C)	center pink
medium	160°F(72°C)	center light pink
well-done	170°F (77°C)	brown throughout

Let it set

Letting a large piece of the meat, such as roasts, stand after roasting allows juices to diffuse into the tissue throughout the meat. This standing period is called *setting of the meat*. During this time not only the juices, but the meat temperature equalize. The oven heats the meat from outside in, therefore the surface area is always hotter. During setting the hotter outside tends to cool while the cooler inside tends to warm. Setting makes carving considerably easier, too. It is a welcome 15-minute time period for the cook when he or she can forget about the meat and can concentrate on sauces, vegetables, bread, butter, beverages, kids, pets and other myriad of tasks before serving the meal. Count on setting a roast for one minute per pound (two minutes per kilo). Even smaller pieces, like steaks, benefit from a short rest before heading to the table.

Raw meat

A third way of serving meat I haven't mentioned yet, is raw. Serving raw meat has two distinct advantages: it involves minimal kitchen work and you can't ruin the meat by cooking it wrong. No one eats raw meat much any more, partly because it is out of fashion but also because raw meat is no longer as safe as it once was when the route from the ranch to the butcher was considerably shorter.

Steak tartar, which is raw, freshly scraped, high-quality beef blended with raw eggs, onion, capers, caviar or anchovy, was a very popular and classy buffet item in the 1940s and 1950s. It was a fad more than anything else. Raw meat doesn't taste very good—it is salty, tastes like blood and is more difficult for the stomach enzymes to break down than cooked meat. True meat flavor only develops during cooking.

Raw meat, in case that’s what you crave for, that you scrape from a freshly-cut surface of a chunk of meat from a healthy animal is still perfectly safe.

Microwave cooking

Because of its speed and convenience, microwave oven cooking has become the way of life in many kitchens. But the microwave is a poor choice for cooking most cuts of meat. If the meat has a lot of connective tissue, the microwave heat converts collagen to gelatin, but if the cut is tender and has little connective tissue, the meat fibers toughen before the meat is done. The microwave also causes more drip loss than either roasting in a conventional oven or in a

combination of microwave and convection heat ovens. The microwaves only partially activate the flavor-producing chemical reactions of the browning reaction and caramelization.

Uneven heating is also a problem when cooking meat in the microwave. Pre-cooked and processed meats, however, do well with this method.

To sear or not to sear

The question of searing meat before roasting has been debated for centuries, and professionals are still divided on this issue. Those who sear before roasting a chunk of meat swear it seals in flavor. Others feel that you end up with drier meat because the high heat means more moisture loss. Harold McGee, a food and cooking guru, conducted an experiment (in 1990) on one-inch-thick (2½-cm) lean steaks, cooked to medium-rare at an internal temperature of 140°F (60°C). This is the moisture loss he measured in the various steps:

While cooking	
moisture loss of unseared steaks	14%
moisture loss of seared steaks	18%
While cooling on plate	
moisture loss of unseared steak	22%
moisture loss of seared steak	25%

The less moisture your steak loses, the juicier, more tender is the meat, so unseared steaks are clearly the best method of cooking. McGee found that the degree of browning and the eye appeal were the same in both methods.

Ever watched an amateur outdoor cook grilling over the barbecue (usually a male)? This cook's main tool is a sharp-pronged fork which he or she uses to repeatedly poke and stab what will end up on your plate as a steak. He flips it again and again and pokes some more holes in it. The meat juices drip into the fire, smelling delicious and creating billows of smoke (while the neighbors wonder if they should dial the fire department), but all that aroma should stay in the meat along with the juices. By the time this "weekend chef" takes the meat off the fire and slaps it on your plate, it is as dry and flavorful as leather.

Never use any instrument to manipulate the meat that can pierce the surface. Each piercing results in more loss of moisture and flavor. Flipping the meat over and back again a number of times serves no purpose. For ideal results, place the meat on a hot babecue and turn once when the first side is done. This makes pronounced grill marks on the first side, the side that should be facing up on the plate. Once you move the meat even a little bit, the grill marks, which add so much eye appeal, disappear. A single flip has the advantage of minimal handling, too. The less you handle the meat, the less chance of juice loss.

Recipes that advocate searing roasts start the process in a very hot oven, then reduce the temperature to low for the remainder of the roasting time. If the meat is a manageable size, browning in oil on top of the stove is also a good way to develop full flavor. One disadvantage for searing in a high-temperature oven is the spattering. The beginning high temperature causes the fat to sizzle vigorously and spatter all over the oven surface. The smoke coming out of the oven and setting off the smoke detector tells you that you can expect more cleanup than you deserve. Roasting on a constant low heat reduces the mess in the oven. From the test with steaks above, searing is not a good idea anyway.

TASTINGS Weight loss at varying internal meat temperatures

Cooking method	Weight loss in percent		
	Rare	Medium	Well-done
Broiling	8-12	15-20	20-25
Pan frying	10-12	15-20	20-30
Oven roasting	8-12	14-18	20-25
Pot roasting			25-35
Stewing			35-50

(Adapted from Banning)

When to add the spices

Food professionals have always debated the issue of when to add spices and flavorings to meat using dry heat cooking method. Some chefs claim that the spices penetrate the meat during the cooking process and you should add them before cooking begins. Controlled testing shows that spices, salt or any other flavoring, only penetrate the meat to about a half-inch (1¼-cm) depth even when roasting for a long time.

When spicing meat, remember that many spices lose their chief flavoring ingredients, essential oils, after prolonged heating. Sturdy flavorings, such as seeds or bay leaf give off their oils slowly. These flavor best when they are part of the entire cooking process. Delicate herbs, such as tarragon or cilantro lose essential oil quickly on heat. For pronounced flavor, add these only during the last few minutes of cooking.

Marinades

Marinades introduce flavor into meat, but they also tenderize. Tenderizers, on the other hand, don't add any flavor. They do nothing more than make the meat more tender.

Marinades are acidic. They contain lemon juice, vinegar, wine, tomato juice, buttermilk, yogurt, even acidic fruit juice, along with spices, herbs and flavorings that give meat a completely different character and a complex flavor. They are only effective on small pieces of meat, no more than a couple of inches thick, because they only penetrate about half an inch below the surface. The acid in the marinade alters the chemistry of proteins (organic chemists' term the acid *denatures* proteins), a process somewhat similar to cooking but without heat. No actual cooked meat flavor develops in this process.

Ideally, marinate meat for at least a couple of hours, even overnight, if you have the time. If not, even a short period in a marinade is beneficial to flavor. If you leave the meat in the marinade too long, it gets mushy on the surface since the acid breaks down the meat fiber proteins.

Another way to introduce flavor into meat is through spice rubs—you rub the surface of the meat with dry or fresh herbs and spices. The meat sits for minutes to hours with the flavorings before cooking. You can make your own spice rub mixtures or buy commercially available products. Spice rubs are effective with moist cooking techniques but don't do much for flavor on high dry heat contrary to what some cookbook authors claim. On high heat most of the flavor components of herbs and spices vaporize within minutes, well before the meat is ready to put on serving plates. The flavors only remain if the flavoring agents successfully penetrated deep into the meat over several hours or days. Or if you add them late in the dry cooking process.

Tenderizers

If you have a tough cut of meat, use a tenderizer to make it tender. They are very effective but, like marinades, they only work on thinner cuts because they won't penetrate more than a finger-width or two below the meat surface. They can overtenderize, too, turning the surface to mush.

Tenderizers contain enzymes that digest proteins and soften them chemically. Three tenderizing enzymes are in common use:

- *papain* from the latex of fully-grown but unripened papaya fruit
- *bromelin* from the stem of mature pineapple
- *ficin* from the latex of unripened fig or the stem of a ripe fig.

Commercial tenderizers blend two or all three in varying proportions because each is effective in a different way. Papain softens meat fibers, but it doesn't degrade the tough collagen very well. Bromelin degrades collagen but has little effect on meat fibers and tough connective tissues (elastin). Ficin is too powerful to use by itself. It degrades both connective tissue of collagen and elastin, but it also affects the meat fiber proteins. A blend of the three enzymes in an optimum ratio tenderizes meat superbly. Tenderizers come in both sprays and dipping solutions.

The food service industry also tenderizes meat with mechanical devices. One way is with a machine that pierces it with hundreds of needles before they apply the tenderizer. You can do the same thing in your kitchen by repeatedly piercing a tough chunk of meat with a fork.

Another way to tenderize tough cuts is mechanically. Use a special meat mallet to pound tough cuts. The mallet breaks up the tough fibers and connective tissues. There is also a small home kitchen tool with steel blades that also effectively breaks down fibers.

TASTINGS Mechanical tenderizers

There are two ways to tenderize meat with machines:

Needle tenderization—the meat runs through a machine with a bank of closely-spaced needles that sever connective tissues and muscle fibers.

Blade tenderization—the meat runs under many rows of parallel blades, each row rotating in opposite direction. They use this same machine to piece trimmings together to make cubed steaks.

Commercial steak houses use both chemical and mechanical tenderizing a lot. The tougher but flavorful cuts and lower grades meat make wonderful steaks after tenderizing and their prices remain quite affordable

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Hints from the chef

Here are some assorted hints to help you with your meat cooking.

Beef. This list from the National Cattlemen's Association gives you beef steaks with decreasing degree of tenderness.

- Tenderloin
- Chuck top blade
- Top loin

- Porterhouse/T-bone
- Rib
- Rib-eye
- Chuck-eye
- Round tip
- Top sirloin
- Chopped steak

Veal. Veal comes from young cattle. It is a very tender, light-colored meat with little or no fat and connective tissue. They market virtually all veal and calf fresh (not frozen). The meat has a high moisture content and doesn't improve with aging as beef does, so you want to use it soon after purchase. Baby veal is the most tender and lightest in color of all veal but with very little flavor. It comes from baby animals of mere 2 or 3 days old that weigh between 22 and 55 pounds (10 and 25 kg) (not much more than a large tom turkey).

Meat labeled veal comes from slightly older 1 to 3-month old animals that were entirely milk-fed. The meat is white (there is no iron in milk that would darken the color). If the veal is not white, the animal had supplemental feed, that turns the color pink. Meat labeled calf is still from a young animal in the 3 to 8-month range, just a little older than veal. Calf meat is tender but no longer a light pink color.

Baby beef is another category you occasionally see at the meat counter. This comes from immature, 7 to 10-month old cattle. Ranchers usually sell these when economic reasons or adverse weather conditions force them to reduce herd size. Although low-priced, this meat isn't a good buy because these young animals have already lost the desirable characteristics of veal, but haven't yet developed the true beef flavor and marbling.

By itself, veal is dry with little flavor. Its low fat and high moisture content does poorly in dry heat cooking. It is best if you sauté veal (because frying oil adds lubrication), or serve it in rich sauces or with high-fat fillings.

Retail cuts of veal are similar to beef, but the size is smaller—veal round steak, for example, is smaller than a beef round steak.

Pork. Because pork used to be much fatter, you may have to alter recipes from older cookbooks. Add a little more liquid and baste more frequently to compensation for today's leaner pork.

Like other red meats, pork is best when you roast it slowly at a low oven temperature. If you rush it, you'll lose more liquid and a hard outside crust forms that heat cannot penetrate evenly. Part of the roast may be done while the rest is still pink. The hard crust also makes carving thin slices difficult.

Cured pork cuts. Salt pork and some brine-cured hams (Virginia and Smithfield, for example) are too salty for many people's tastes. The answer is to soak some of the salt out. If it is a whole ham, soak it for 24 hours, changing the water many times. A small piece of salt pork takes much less time. Cover it with cold water, bring it to a boil, and simmer for 3 to 4 minutes.

Salt content, age of the meat and texture all make a difference. No exact timeline exists to guide you how long to soak a particular piece of salted meat. Let the piece of meat soak a while and then give it a lick test. Keep doing this until you are satisfied with the flavor.

Bacon. Have you ever wondered how much edible meat you actually get when you buy bacon? I selected three different brands: a high-quality bacon from a butcher shop, a better-quality bacon from a supermarket deli counter and a standard lower-priced, but not bottom-of-

the-line brand, from the supermarket display case. I carefully weighed each batch on a laboratory scale and fried them to identical crispness, then weighed the final edible portions again. The butcher shop bacon and the better-quality supermarket bacon yielded close to the same amount of meat—about 35 percent of the original weight. The standard brand only yielded 27.5 percent. What I lost, nearly three-quarters of the total, was fat and water. The higher-priced bacon had better flavor and the cost per pound (or per kilo) of the edible portion worked out about the same as of the lower-priced bacon. When you buy bacon, it is more economical to buy a better-quality package and you get a better flavor.

Considering such a high loss, bacon costs more than most of the highest-quality meats. In fact, the price of the edible portion is only just below the price of the highest-priced item in the butcher's display, fully trimmed beef tenderloin steak or filet mignon.

Lamb. Lamb has a delicate flavor, but to retain it without a gamy overtone, know how to cook it properly. Lamb fat is a hard fat with a lower smoking point than other animal fats, and it burns easily if the temperature is too high. Once it burns, it develops an unpleasant odor and flavor. Never roast lamb in an oven higher than 325°F (165°C).

Leg of lamb has a thin membrane completely surrounding the meat, separating it from the fat layer. This is called the *fell*. The butcher doesn't remove it because it holds the bundle of muscle together and helps to retain moisture during cooking. It should be removed, however, in steaks and chops. If it is still there, simply pull it off with your fingers. If you don't do this before grilling or broiling, the heat shrinks the fell and makes the meat buckle—as a result it browns unevenly and looks unappealing. Scoring the fell in several places also helps to avoid curling.

The term spring lamb refers to the very tender meat from lambs born in the spring, but in North America today it has no meaning because of improved shipping. Lamb ranchers and processors provide young, tender, spring-lamb quality meat year round. In California, Arkansas and parts of the South, young lambs are born in the fall and flourish in the mild winter. They provide tender meat before the true spring lambs are born in cooler parts of the country.

Points to Remember

- Read the label carefully when you buy meat. Understand the meat grading system.
- Buy beef and lamb roasts and steaks a few days in advance to give extra time to age but use veal and pork soon.
- Fine-textured, tender meat with little connective tissue is ideal with all dry cooking methods, but these cuts have the least flavor. Coarse-fibered, tougher cuts are great with moist cooking methods. These are the highly flavored cuts.
- Use the method I suggested above to freeze meat as quickly as possible, but thaw meat slowly in the refrigerator. Both help to preserve meat juices and tenderness.
- To reduce the chance for rancidity, wrap meat thoroughly to store, particularly when freezing. To avoid warmed-over flavor, store cooked meat only for a short period and, whenever possible, under sauce.
- For tender, juicy, flavorful meat, use an accurate thermometer in all dry cooking methods and a very sharp knife to cut the meat. Aim for an internal temperature of 140° to 147°F (60° to 64°C) for most tenderness.
- Always brown meat first with any cooking method for maximum flavor.
- Initial searing of meat at high temperature is not necessary. Unseared meat ends up juicier.

- Marinade adds flavor to meat, and tenderizes it. Tenderizers don't add flavor, only softens the meat.
- Add spices and herbs late in moist cooking methods.

Beef

Primal Cuts	Retail Cuts	Comments
Chuck	Roasts: cross-rib, shoulder, chuck, neck, blade, 7-bone, eye Steaks: shoulder, arm, eye, mock tender, 7-bone, top blade Other cuts: chuck flat ribs, short ribs	Not very tender but flavorful and reasonably priced
Rib	Roasts: rib, rib-eye Steaks: rib, rib-eye Other cuts: short ribs, back ribs	This primal cut is divided into large end and short end
Loin	Short loin cut into top loin, T-bone, porterhouse and tenderloin steaks. Sirloin cut into sirloin, top sirloin and tri-tip steaks or left whole as tenderloin tip roast	Divided into short loin and sirloin. Most tender, highest priced beef. Sirloin may be bottom or top cut
Round	Roasts: rump, eye of round, tip and round Steaks: eye round, top round, round, round tip	Not tender but reasonably priced. Not as good flavor as chuck. Divided into top and bottom rounds
Shank	Cross-cut, center-cut. Commonly used for ground meat	Tough meat full of connective tissues. Low-priced, high in flavor. Excellent for slow-cooking, soups
Brisket	Brisket	Tough, coarse meat, highly flavored, low-priced. Needs marinating or tenderizing
Plate	Skirt steak, skirt steak roll, plate roll, short rib, spare rib. Commonly cut for stew meat or ground up	Tough, coarse meat with good flavor, medium-priced. Needs marinating or tenderizing
Flank	Flank steak, may be rolled into flank roast. Tenderized into cube steak	Tough, coarse meat, medium-priced. Flank steak benefits from tenderizing

Veal

Primal Cuts	Retail Cuts	Comments
Shoulder	Roasts: chuck, clod, shoulder Steaks: arm, blade	
Rack (Rib)	Roasts: crown, rib, rolled rib, ribeye Other cuts: rib chops, riblets	Crown roast made by tying two or three rib pieces together while standing vertical
Loin	Loin, loin chops, strip loin, tenderloin	Veal chops include tenderloin part that is separated in beef
Leg	Roast: sirloin butt, top round, bottom round Steaks: sirloin, round, flank, cutlets	Leg includes sirloin part
Breast and Shank	Boned then rolled into roast. Foreshank, short plate, brisket point. Flank may be ground up. Breast often diced or ground up.	

Lamb

Primal cuts	Retail Cuts	Comments
Shoulder	Boned, rolled and tied into rolled shoulder roast or cut into blade and arm chops	Largest, most flavorful cut of lamb; difficult to carve if not boned
Rack	Crown roast of lamb. French or American ribs. Rib roast	2 or 3 vertical 8-rib sections tied together into crown shape. French ribs: flesh scraped off tops of vertical rib bones. American ribs: meat left on ribs
Loin	Loin roast. May be cut into loin strips, loin chops	
Leg	Leg roast or boned, rolled and tied as boneless leg. Cut into leg steak, sirloin chops. Rump part cubed into stew meat	Leg includes sirloin part from the loin
Breast	Breast roast or boned, rolled and tied as boneless breast roast. May be cut into ribs or individual riblets	Breast includes ribs

Pork

Primal cuts	Retail Cuts	Comments
Shoulder	Roasts: Boston butt or boned and tied as boneless Boston butt, picnic. Picnic and butt may be smoked. Ends cut off as smoked hocks. Picnic cut into cutlets and steaks	Shoulder is divided into picnic and butt
Loin: blade end	Roasts: boneless loin, top loin, tenderloin, crown roast, rib end roast Loin chops, smoked loin chops, rib chops, rib steaks, cutlets	
Loin: center section	Center-cut roast, may be cut into center-cut chops (rib chops), chops may be smoked. Cured and smoked loin is Canadian bacon. Bony part is back rib, boneless part is tenderloin	
Loin: sirloin end	Sirloin roast. May be cut into sirloin chops or cutlets	If sirloin roast is too small, two are tied together
Belly	Bacon if cured and smoked, side pork if not, salt pork if salted. Spare ribs	Belly is mainly fat with little meat

I want there to be no peasant in my kingdom
so poor that he is unable to
have a chicken in his pot on Sundays
Henri IV of France, 1553-1610

CHICKEN AND ITS COUSINS

Poultry is the most accepted meat worldwide, having almost no religious, cultural or ethnic taboos. There are a few small exceptions. There is a small African tribe, as one example, that considers the bird sacred and uses both chicken and egg exclusively for religious ceremonies. They even killed European missionaries who ate eggs in their presence.

Because they are not charming as pets, most members of the poultry family don't enjoy the benefit of a political advocacy group that goes to bat for their living conditions, or other rights. Poultry ranchers can concentrate on efficiency and the bottom line rather than creature comforts or animal psyches. Even some so-called vegetarians will eat poultry occasionally, claiming “it is not really meat." When a host or hostess is uncertain about the eating habits of guests, poultry is the safest meal to serve. Those reluctant to eat red meat or allergic to seafood are still willing to participate in a good poultry dinner.

Chicken is wonderful for its low price, for its ease of preparation, for its reasonably low fat and cholesterol content and for its flavor (when you know how to cook it well). Chicken is by far the most popular fowl on our dinner tables. During the 15-year period from 1980 to 1995, American chicken consumption increased 57 percent, turkey consumption 84 percent.

Chicken is a surprisingly late introduction to the society of domesticated animals. It only took up residence in barnyards and back yards about 4000 years ago, anywhere from 2000 to 6000 years later than other domesticated animals. Why it came along so late is still a mystery to cultural anthropologists. You would think taming a bird is much simpler than domesticating a horse, sheep or pig. It is so easy to catch baby birds, clip their wings and feed them until they are big enough to serve at Sunday dinner.

Chickens began as jungle fowl in Southeast Asia, probably in today’s India. Humans may have been drawn to them originally out of admiration for their aggressive cockiness. People used chickens first in sacrificial ceremonies and sport fighting, then they promoted them (or demoted, depending on your perspective) to the cook pot.

Whatever the original reason for their domestication, chickens have come a long way from the common barnyard birds that just a century ago were a part of every rural and many urban households. Now chickens are mass produced at a scale unimaginable back then. A single modern U.S. chicken plant processes 20,000 broilers every *hour* (that’s 330 per minute). The processing is high-tech, high-speed and clean. The highly mechanized and efficient operation is one major reason for the low price of chicken. Cheap chicken feed and the chicken's efficient way of using it are the others.

Nutrition

Poultry is an excellent source of protein, which makes up 28 to 30 percent of both chicken and turkey meat. The rest of the meat is water, fat, a small amount of carbohydrate and minerals.

Comparison of Protein and Fat in Poultry
(cooked 4-ounce or 115-g servings)

Protein		**Fat**			
		With Skin		*Without Skin*	
%	**Gram**	**%**	**Gram**	**%**	**Gram**

Chicken	28	31	14	16	7	8
White meat	29	33	10	11	4	5
Dark meat	26	30	15	17	9	10
Turkey	28	32	10	11	5	6
White meat	30	33	8	9	3	3
Dark meat	28	32	11	12	7	8
Goose	25	29	22	25	13	14
Duck	19	22	29	32	11	13

Fortunately for people on low-fat, low-cholesterol diets, a layer right underneath the skin concentrates a lot of the fat along with the cholesterol. Most of the fat peels off with the skin. But that has a downside, too. Of the two types of flavor compounds, fat carries all the fat-soluble ones, so you also remove those. But even skinless poultry can provide a flavorful meal.

In the table above, notice the difference in both fat and protein between white and dark chicken meat. Dark meat is higher in fat (and it has more flavor). The same is not true for turkey. Dark and white turkey meat have less difference in their fat and protein than does dark and white chicken meat. Goose and duck meat have consistent amount of fat and protein throughout the fowl, irrespective of the type.

Chicken Basics

Today's chickens are descendants of several varieties cross-bred for fast growth, good skin tone and appealing meat. A baby chick is encouraged to grow fast and turn into a four-pound broiler in 6 or 7 weeks. A relatively high percentage of the feed translates directly to edible meat. Four pounds (2 kg) of chicken feed adds 2 more pounds (1 kg) to total body weight. Thanks to this efficient use of feed, chicken is our lowest-priced source of meat protein.

In spite of its quick growth and low price, chicken meat can be very good if you know what to do with it in your kitchen, and have a repertoire of well-tested recipes. For most beginner cooks, chicken is probably the second meat they learn to tackle. (First is a beef steak, the simplest to cook—and ruin.)

The difference between dark and white meat is in the amount of work the two types of muscles perform in life. Dark meat comes from much-used muscles—thighs and legs. No matter how confined these birds are in modern chicken coops, they do use their leg and thigh muscles some. Dark meat contains more fat, has a slightly coarser grain and is tougher than white meat. These muscles use oxygen to burn fat for energy for the steady work of moving around. *Myoglobin*, an iron-rich dark reddish brown protein stores the oxygen in these muscles. The higher fat and myoglobin content accounts for the slightly stronger flavor and darker color in dark meat.

Aside from an occasional flapping of wings when they stretch, these birds use their breast muscles not much more than the muscles that wiggle our ears. These muscles use *glycogen*, a sugar as a source for energy, not fat. Glycogen does not need oxygen to convert to energy, so in white meat, such as in breast, there is lack of the dark-colored oxygen-storing myoglobin, and the meat is light-colored.

Size and shape

Chickens are sold at different stages of growth, which also affects the amount of fat in the meat. Young, tender broilers are the favorite size, they weigh about four pounds (nearly 2 kg). Broiler meat is very tender, but it hasn't had time to develop the full flavor of the older and larger roasting hen, whose meat is nearly as tender. A stewing hen is an old, tough, full-flavored bird. A capon is a castrated male, large and tender, with lots of white meat. It is very good for roasting. Rock Cornish hen is a cross between Cornish game hen and chicken. Each hen provides one serving with low fat and plump breasts.

Age and Weight of Chickens

Type	**Age**	**Weight Range**
Broiler/fryer	6-8 weeks	2.5-5 lbs.
Roaster	3-5 months	3.5-6 lbs.
Stewing hen	1 year	4-6 lbs.
Capon	15-16 weeks	9.5-10.5 lbs.
Rock Cornish hen	5-6 weeks	0.75-2 lbs.

Buying Poultry

Buying poultry takes no great shopping skill. Poultry purchase for most of us means buying chicken and, a few times a year, a turkey and a rock Cornish hen. Ducks and geese are rare on our tables—they are more common in Asian and European households. Pheasant, squab and quail are even less common. We eat those more in white-tablecloth restaurants and exclusive clubs. Ostrich and emu are two exotic poultry that few of us know what to do with. They are both high-priced specialty meats that are not yet widely available.

The poultry section of any meat counter is large but variety is not. Chicken is the main stay, either whole or cutup, bone-in or boneless, and they are mostly young broilers, also called fryers. They cost the least to raise, so they can sell them for the lowest price. If you want to roast a chicken, you are better off to pay a little more for a true roasting chicken or a capon with better-developed flavor. You usually find them whole in the freezer section, like holiday turkeys. Occasionally you will find a roaster already defrosted or fresh.

Low price and high quality never go hand-in-hand. Today's young broiler chickens have much less flavor than they used to because they grow too fast and in too short time. There is plenty of added water to further dilute the flavor (up to 7 percent of the weight by U.S. law). Specialty meat and poultry markets sell better poultry raised with more care and with less added water but at higher prices. The only way you can be sure it is worth the extra cost (you pay about 70 to 80 percent more) is to try it. If you can tell the difference between the supermarket chicken and what you buy in specialty markets, don’t hesitate to pay the extra for the better quality.

Whole vs. cut-up, boneless vs. bone-in

What you're using it for and your personal preference both play a role in which of the four choices you should choose—whole, cut-up, boneless or bone-in chicken. But other factors are involved, too. For instance, is boneless or bone-in poultry more economical? The difference in the cost of the edible portion between the two is sometimes notable enough to ponder. Your

decision depends on whether money or time is more valuable to you. If *you* don't bone it, someone else does, and the extra cost of deboned meat is to cover the extra labor.

An experienced worker in a meat packing house can skin, cut up, trim and debone a whole chicken in 2 minutes. To debone a breast or thigh takes only 10 seconds. Even a professional chef cannot come close to that speed. It takes most of us 10 to 15 minutes to cut a whole chicken into standard serving pieces and cut out the backbone and neck. To properly debone a breast or thigh takes 2 to 3 minutes each.

Boneless skinless breast meat costs about 25 percent more than bone-in breast (cost of edible portion only). Boneless thigh costs 40 percent more than bone-in. For many cooks, the saving of time in the kitchen is worth the added cost. An added benefit of boning it yourself, of course, is having that nice collection of bones and skins available for making a chicken stock.

The table below lists conversion factors to determine the actual cost of trimmed and deboned meat, starting with bone-in untrimmed chicken. (This was modified from a U.S. Department of Agriculture Handbook.)

To arrive at true cost per pound (or 100 g) of boneless chicken, multiply cost of bone-in by

legs	2.0
thighs	1.7
legs and thighs	1.8
breast	1.5

As additional help, keep in mind that

- one pound (450 g) of bone-in breasts yields 10 to 11 ounces (280 to 310 g) of boneless skinless breast meat
- one pound (450 g) of thighs and drumsticks yields 8 ounces (225 g) of boneless skinless dark meat

Other kinds of poultry

Today’s turkey farmers breed turkeys for their meatiness, with 35 to 40 percent of the total weight in the breast, another 25 to 30 percent is leg meat. They sell turkey hens in 3 to 4 months that weigh about 13 pounds (5.9 kg). They allow tom turkeys to grow for 5 to 6 months when they reach a weight of 22 to 26 pounds (10 to 12 kg) before they show up in the supermarket. Hen and tom turkeys don't differ much in tenderness and moistness.

The most commonly sold turkey is whole or cut into steaks, breasts and leg meat. Processors rework some into rolls, franks, bologna, sausage, salami and bacon, often mixed with other ingredients and reformed into simulated breasts or roasts. They can control the texture and flavor of the final product to be uniform and always predictable. True turkey lovers complain that it doesn't resemble the real thing, and that is true. But it serves a purpose—it is a high-protein, low-priced food for people on low budgets.

You can also buy turkey already smoked, breaded or marinated. Because of its low fat content, turkey meat became immensely popular in America in the 1980s and 1990s. By the mid-1990s, 75 percent of all turkeys sold in the U.S. was cut up or further processed. We eat the rest almost entirely as whole roasted turkey during the holiday season. In the 1950s and 1960s, Americans and Canadians ate 90 percent of turkey meat whole during the months of November and December.

Duck and goose have never been as popular in North America as they are in Europe and China. We cannot attribute their lack of popularity to their flavor, which is excellent. Perhaps it has more to do with turkey getting a leg up by winning the national bird contest way back when. Turkey and chicken won out even before people began to worry about the higher fat of duck and goose.

A 2-month-old duck has a dressed weight of around 6 pounds (2.7 kg). Geese are allowed to live to the ripe old age of 3 to 5 months and have an average dressed weight of 10 to 11 pounds (4.5 to 5 kg). Consider either one for an occasional meal as a change from everyday chicken. If you're watching your fat intake, stick to skinless breast meat.

Safe Chicken

No serious outbreaks of food poisoning have been associated with poultry. That isn't because the chicken industry standards are markedly more hygienic than the rest of the meat industry. It has more to do with the common knowledge that you cook poultry until it is well done. If you are served pink or slightly bloody chicken in a restaurant, you send it back to the kitchen with some angry comments about the intelligence of the chef. Beef steak cooked to the same undoneness is not only acceptable—many diners demand it. The internal temperature of completely cooked chicken meat should be a minimum of 150°F (66°C), measured in the center of the thickest piece. At this temperature no red or even pink tinge remains in the juice, although a slight pink in the meat is not harmful.

The meat itself is not a safety problem. Fresh meat from healthy chickens is as sterile as the surgeon's scalpel. Contamination comes from various sources, particularly from hands, during processing, packaging, shipping and all the handling along the way.

Safety expert traced several food poisoning outbreaks in the U.S., starting in 1993, to a new strain of an otherwise benign bacteria known simply as *E. coli.* (For discussion, see Safety in Meat chapter). No major outbreak affected any poultry but it very much worried the poultry industry. All it takes is one outbreak to have consumers stampede from chicken to red meat, seafood or no meat at all. Cleanliness and hygiene in poultry processing plants has reached the level of the sterile environment of a hospital emergency room. This is comforting but we can't relax our standards in our own kitchens.

Try to avoid growing bacteria, keep poultry in the refrigerator or freezer all the time. Microbes grow and multiply rapidly if you hold your poultry at temperatures much above your refrigerator's, about 40°F (5°C). When you need to thaw frozen poultry, plan ahead and defrost it slowly in the refrigerator. Not only is this a safer practice but a more gentle way of defrosting, resulting in juicier, more tender meat. And be sure to cook poultry with no trace of red remaining.

Cooking Poultry to Perfection

Without doubt, poultry is the most versatile of all meats. We eat poultry any way imaginable except raw. Chicken, particularly today's quick-raised supermarket broilers, have relatively little flavor. It is cooking and flavoring that transform that low-flavor chunk of meat into a delicious dish. Check this out for yourself. Steam or poach a piece of chicken breast and add nothing but salt. Your cat might even turn its nose up at the bland flavor. But poultry has the admirable quality of snatching, borrowing and soaking up flavors that you either add directly or

into the liquid it cooks in. But that's not all. The chemical reactions triggered by heat, particularly browning, what transform the bland to delicious.

The two broad categories of cooking poultry are:

Dry heat cooking:

- grilling (barbecuing) or broiling
- sautéing
- deep-frying
- stir-frying
- baking

Moist heat cooking:

- braising
- stewing

With dry heat cooking methods, high temperature without additional liquid cooks the meat. The change in moist cooking occurs at a lower temperature with additional flavored liquid. A second major difference between the cooking methods is the final internal temperature of the poultry. In dry heat cooking strive to reach an internal temperature of slightly above 150°F (66°C). This gives the juiciest poultry meat. In moist cooking, the final temperature is the same as the liquid the meat cooks in—simmering temperature.

Please see detailed discussion on each cooking method in Meat chapter under Guide to Preparing. Here we concentrate on cooking information that is specific to poultry.

Dry cooking

In grilling, broiling and baking you add nothing to the meat but flavoring and sometimes, if the poultry is too dry, a little fat. In sautéing, deep-frying and stir-frying, oil and high temperature convert the meat into a succulent dish.

All dry-cooking methods use high temperature, at least 300°F (157°C) in baking, much higher in grilling and broiling. At such high heat browning and the accompanying flavor changes are assured, and the changes happen quickly. Stand by with a thermometer in one hand.

Baked chicken breast Roquebrune

It is the marinade that creates the complex, deep flavors when combined with flavor products of the browning reaction in the oven. This is not a high-acid marinade, so slow steeping for 8 hours is not as excessive as it may seem. This recipe is a good example of the dry heat method.

The lemon juice and the slight acidity of the sour cream break down and tenderize the meat fibers while the rest of the marinade ingredients permeate the chicken with flavor. Following marinating, you coat the breasts with a mixture of bread crumbs and parmesan cheese. The combination of the oven-browned flavor of the coating tops off the delightful taste of marinade and chicken.

For this recipe it is best if you skin the boneless breasts. If you leave the skin on, it can’t brown under the blanket of breading to give you crisp skin—and is there any other way chicken skin is good?

Ingredients
6 boneless skinless chicken breasts, 5 to 6 ounces (140 to 170 g) each
6 tablespoons fine dry bread crumbs
4 tablespoons grated parmesan
4 tablespoons butter, melted

Marinade
2 tablespoons lemon juice
2 teaspoons salt
1 tablespoon Worcestershire sauce
1 clove garlic, finely minced
1½ tablespoons fresh rosemary, chopped (or 1½ teaspoons dry)
2 teaspoons paprika
1 teaspoon freshly ground black pepper
1 cup sour cream

Procedure

1. To make marinade, in a medium bowl blend lemon juice, salt and Worcestershire sauce. Stir until salt is dissolved. Blend in garlic, rosemary, paprika and black pepper. When uniform, gradually stir in a few spoonsful of sour cream, blend again, then stir in all the sour cream.

2. Rinse chicken breasts and place them in a non-reactive container or self-sealing plastic bag. Pour marinade over and mix by hand to cover each well. Refrigerate for 8 hours. Halfway through marinating, turn breasts over and redistribute the liquid. Remove from refrigerator half an hour before baking.

3. Preheat oven to 350°F (180°C). Mix bread crumbs and parmesan on a pie plate. Remove chicken breasts from marinade and let the excess liquid drip off. Dip each breast into the bread crumb-parmesan mixture to coat uniformly. Shake off excess crumbs. Place breasts side by side on a lightly oiled baking sheet. Drizzle half of the melted butter over the top. Place the baking sheet in the center of the preheated oven and bake 45 minutes, checking occasionally.

4. Turn each breast over on the baking sheet and drizzle tops with the rest of the melted butter. Bake 10 more minutes or until nice and brown.

Serve fresh out of the oven garnished with lemon wedges and rosemary sprigs. Parsleyed mashed potatoes or pasta drizzled with olive oil go well with this chicken.

Makes 6 portions.

To arrive at the desired internal temperature, you need a good instant-read thin-stemmed thermometer, digital or analog. When you think you are near the end of the cooking period, monitor the progress often. Stop socializing, bring your glass of wine in the kitchen and concentrate on the bird. If you let the temperature go too high, the meat fibers contract, releasing some of the juices. The meat gets drier, less tender, less palatable. Your aim is to stop cooking it as soon as your thermometer hits 150° to 155°F (66° to 69°C) in the thickest part of the meat. If the piece of poultry is large, for example, when you're roasting a whole chicken or turkey, or even a turkey leg, stop at 145°F (63°C). The temperature will creep up for a few more minutes after you remove it from the heat, still reaching the target temperature.

Roasting a whole bird

The biggest challenge in poultry cooking is roasting a whole bird. How can you get both white and dark meat to come out at the same degree of doneness? That is a challenge. Dark meat forms thick chunks in the legs and thighs with a thick bone in the center. It takes longer to heat such massive pieces to the correct temperature than the breast meat which is less bulky and with only thin bones as support.

Creative cooks have found some solutions to this problem, none of them easy. You can rotate the bird in the oven part way through roasting to have the legs and thighs exposed to heat as much as possible and drape cheesecloth over the breast to keep it moist and slow its cooking slightly. (Remove the cheesecloth during the last half hour to allow the breast to fully brown and crisp.)

Basting frequently also helps. The cooking time remains the same, but the breast tends to retain more moisture when you baste. A troublesome technique that works perfectly well is to debone the entire bird and butterfly the meat (split it through the center so only a narrow piece of meat remains to hold the two halves together, then unfold it like butterfly wings). Sounds like a lot of work, but if you have a little experience with cutting up chicken or turkey, you can do the job in about 15 minutes. The butterflied bird, when flattened, cooks quickly and evenly in the oven or over the coals, and it is a snap to cut it up into serving pieces.

Roasting duck and goose produces delectable crisp skin and deliciously succulent, moist meat. The challenge is what to do with the extra fat. The fat is in a thick layer between the meat and the skin. You can melt most of it out by starting to roast in a slow oven. Later, raise the heat to finish browning the meat. To facilitate melting the fat, slip your hand between the meat and the fat layer (not between the fat and the skin) and separate the two.

A Chinese Peking duck technique is more complicated but very efficient and elegant. Immerse the duck or goose in boiling water for a minute, then let it air dry in the refrigerator for a full day. This rest time tightens the skin over the fat layer. When in the oven, the pressure of the tight skin helps to melt the fat.

Unlike in chicken and turkey, there is less distinct white and dark meat in goose and duck. That helps to finish cooking both to the same degree of doneness.

TASTINGS Weight Loss with Different Cooking Methods

The less weight poultry loses in cooking, the juicier the meat will be. What you lose is meat juices. Below are the weight losses for three cooking methods (modified from Stadelman, *et al.*).

- stewing 22%
- frying 23%
- roasting 31%

You lose the least in stewing because the surrounding liquid inhibits the loss of juices. The flavorful juices remain in the pot. Roasting is a slow, long process, so you expect a relatively high moisture loss. Much of the liquid evaporates but the flavor remains in the drip pan. The high temperature of frying also promotes moisture loss that you see as steam billowing up, but this method is so quick that there is not enough time for too much to escape.

> The amount of moisture loss has implication on serving size, too. A roasted chicken, that lost a third of its weight as moisture is more concentrated meat than a juicier fried chicken that lost quarter of its weight. Thus, a four-ounce serving of the two are not the same size servings. You give more meat in a serving of the roasted chicken than in fried chicken.

Rubber chicken

What about the famous rubber chicken, the staple at large banquets? Could it be a different poultry species altogether? Are only large hotels and banquet halls allowed to purchase these birds from special rubber chicken farms? Actually, you can make rubber chicken yourself at home for a fraction of the cost. Follow these steps carefully, as those banquet halls do.

Buy a regular frozen broiler and bring it home. Instead of defrosting it in the refrigerator over a day or two, place it in a large bowl and run cold water over it to defrost as fast as possible. This guarantees the most moisture loss. Then roast it, whether whole or in serving-size pieces, in a hot oven. Continue to cook beyond the well-done stage until the internal temperature measures at least 175°F (80°C). Remove from the oven and let sit on the counter for 40 to 50 minutes until lukewarm. Then serve. For extra dryness, you can return the already-overcooked chicken to the oven for 20 minutes to reheat it just before putting it on the table. I guarantee the result will resemble rubber.

Hotels and caterers in large banquet halls regularly produce rubber chicken. No matter how large the kitchen in these facilities, it is not large enough to allow 200 or 300 birds to defrost slowly for days under refrigeration, which is the ideal way to do it. The uncertain timing of banquet speakers makes it impossible to serve the food right out of the oven the first time. They cannot risk the speaker quitting early and having the guests sitting around talking to each other waiting for the next course, so food service folks are forced to have it ready long before they can serve it. Most red meats hold well under such conditions, but not chicken and seafood. Next time you are in charge of the banquet food, choose something in a sauce. It may not be as elegant but it holds much better.

Moist cooking

The second major method of cooking poultry is in liquid. Obviously, when cooking in simmering liquid the temperature of the poultry cannot rise above the boiling point of water. These are slow-cooking techniques that can give just as intense flavors as dry cooking. The drawback of moist cooking is that the important browning reaction, which produces that fabulous roasting aroma and flavor, is missing.

But there is a solution. To remedy the problem, most moist cooking recipes instruct you to brown the chicken in fat first, then add the liquid and continue to slowly stew or braise. These recipes combine the advantages of dry and moist cooking, producing great flavor and tender meat. But this takes extra work. Some cooks skip the meat-browning part, not realizing that what they save in time, they lose in flavor.

I conducted a series of controlled kitchen tests to determine whether browning chicken is worth the time and effort it takes. I prepared the same stew-style recipe in two batches, browning the chicken in the first and not browning it in the second. Otherwise ingredients and cooking techniques were identical (even adding the same amount of extra oil to the unbrowned chicken

that the browned one gained in frying). The results were clear. The browned chicken had sharper, more pronounced and deeper flavor, was juicier and looked a lot more attractive even with sauce covering it. The unbrowned chicken looked and tasted like plain cooked chicken. Consider browning a must, not an option, in all moist cooking methods, whether the recipe calls for it or not.

Cooks divide their opinion whether to brown after dredging the poultry meat with flour or to brown without flour. The role of the flour is to absorb surface moisture and to add flavor through the browning of the flour itself. I tested both methods and found the flavor was not enhanced with flour. But flour does absorb surface moisture. Instead of dredging them with flour, just make sure that you pat the poultry pieces completely dry with paper or kitchen towel. Also make sure the pan is hot and not too crowded. If you put too many pieces in it at a time, the temperature of the oil in the pan drops too quickly, the meat lets out liquid too fast, and it steams before it properly browns.

Moist cooking demands less of your attention than dry cooking, though initially it takes more work. Browning the poultry takes extra effort and is messy, but it is essential to do before you add the flavorful cooking liquid. As you cook it beyond the ideal temperature, the poultry toughens when the fibers contract. But slowly, with longer simmer, the contracted muscle fibers relax, absorb moisture and become tender.

Most of the tough connective tissues also soften and turn into gelatin. Recipes call for at least half an hour of slow cooking, and that is about the minimum time the poultry needs before the shrunken fibers relax and turn as soft as a well-aged brie. Continued slow cooking also helps the meat to soak up flavors to the fullest. But take care not to overcook it. Eventually the poultry becomes so soft that it falls apart as the fibers are no longer able to hold together. Then you are approaching the realm of baby food.

Braising and stewing are two familiar ways to cook poultry with moist heat. Many cooks confuse the two not knowing the difference, which is in the amount of liquid you use. In stewing the meat simmers in flavorful liquid that just barely covers it, while in braising only a tiny amount of liquid in the bottom of the pan steams the meat slowly, just enough to keep it from sticking.

Chicken breasts in sweet paprika sauce

There are scores of superb chicken dishes from all corners of the world and they are as varied as the nations that produce them. Chicken is perhaps the most adaptable of all our meats. It is like reeds that bend whichever way the wind blows—chicken picks up the characteristics and flavor combinations of any cuisine, making them its own. Once you taste this irresistible chicken dish from Hungary, you convince yourself that humans domesticated chickens for the only reason to eat them in a sweet paprika sauce.

Surprisingly, this is one of the quickest ways to prepare a chicken dish. There are few ingredients and the flavor is marvelous. It is critical that you use of good quality, fresh (preferably genuine) Hungarian paprika, a key ingredient for true flavor. Don’t use a paprika from your shelf that has been there for years.

Ingredients

4 boneless, skinless chicken breasts, 6 ounces (170 g) each

3 tablespoons vegetable oil, divided 2 and 1 tablespoons
6 ounces (170 g) (1 medium) onion finely chopped
1 tablespoon Hungarian paprika
½ medium green bell pepper, finely chopped
½ medium red pepper, finely chopped
1 medium ripe tomato, finely chopped (or 1 tablespoon tomato paste plus ¼ cup water)
1 teaspoon salt
2 tablespoons sour cream
1 tablespoon flour

Procedure

1. Dry the chicken pieces thoroughly with paper or kitchen towel. Heat a heavy 9 or 10-inch (25-cm) pan over medium to high heat. Brown both sides of the breasts in 2 tablespoons vegetable oil, about 8 to 10 minutes. Remove chicken and set it aside.

2. Reduce heat to medium, add remaining 1 tablespoon oil and sauté onion just until it begins to change color. Add paprika and continue to sauté for one minute, stirring constantly. (This step intensifies the paprika flavor by slightly caramelizing the sugar it contains, but be careful. If it browns too much, you'll end up with a bitter taste).

3. Quickly add tomato, red and green peppers and continue stirring a few more minutes. Add chicken and salt, reduce heat to low, add a few tablespoons of water, if needed, cover pan and simmer very gently for 30 minutes until chicken is tender and has absorbed the flavors from the liquid. Check the moisture level once or twice, replace if necessary.

4. While the chicken is simmering, blend flour and sour cream in a tiny bowl into a smooth, lump-free paste. Stir some hot sauce from the pot into the paste a teaspoonful at a time until the blend has the consistency of light cream.

5. Shortly before serving, stir the sour cream blend into the sauce. This both tones down the flavor and thickens the sauce. Continue cooking uncovered, barely bubbling, for 10 minutes, stirring frequently. Serve over buttered noodles sprinkled with one tablespoon poppy seeds, on the side fresh-cooked vegetables or marinated cucumber salad. Garnish with red or green pepper rings and a dusting of paprika.

Makes 4 portions.

Adapting old chicken recipes

If your favorite chicken recipe is old, add less liquid than specified. If needed, you can always add more later. Poultry processors add more water today than was standard 50 years ago. Here is why.

Immediately after cleaning, they chill the poultry in ice water for several hours to rapidly lower the temperature of the meat. This helps to reduce the growth of bacteria and slows the deterioration of the meat. Soaking also loosens surface dirt and helps in a thorough cleaning. The downside is that it gives the meat time to soak up water, too, for which you pay at the checkout stand. After soaking, they quickly freeze the poultry. When the supermarket meat clerk or you defrost the poultry, some of this water leaks out, but most of it remains between the skin and the meat, and that is all yours (after all you paid for it). Because of all that excess water, add just the smallest amount of liquid to the pot when stewing or braising, then recheck the liquid level

halfway through cooking.

Serving poultry cold

It is great to find leftover turkey or chicken in the refrigerator the day after a feast of a oven-roasted bird. Newspapers and magazines offer scores of ideas of what to do with leftovers during turkey season.

Cooked meat holds better in the refrigerator, than raw meat because through heat you got rid of harmful microorganisms and deactivated enzymes in the chicken that otherwise start to spoil the meat. But the flavor just isn't the same after three or four days as it was the Friday after Thanksgiving. Food scientists refer to this phenomenon as *warmed-over flavor* and I discussed in detail in Warmed-over flavor in the Meat chapter. Poultry is exceptionally susceptible because it is high in unsaturated fats, which tend to turn rancid faster than saturated fats.

As with most chemical reactions, lowering the temperature and limiting oxygen contact minimizes oxidation. Wrap any leftovers carefully and store them in the refrigerator or freezer as soon as the are cool. Covering the meat with a sauce to keep oxygen from attacking it is another excellent way to reduce warmed-over flavor. Meat stored in gravy has five times longer shelf life than if it is wrapped securely but stored without sauce.

Cold cooked poultry is a fine addition to salads, but don't use the pieces that you cooked in water to make a poultry stock. The flavor of that meat is all in the liquid, and what is left gives nothing but a good texture to salads. Instead, marinate fresh chicken or turkey in your favorite marinade, and bake the marinated pieces specifically for your salad.

Points to Remember

- Poultry is one of the highest sources of all meat proteins, and without skin it is reasonably low in fat and cholesterol.
- Whether you buy your chicken whole or cut-up, boned or bone-in depends on what you have more of, time or money, and on how skilled you are with a knife.
- If you use any of the dry cooking methods, stop the cooking process as soon as the internal temperature of the meat in the center of the thickest part reaches 150° to 155°F (66° to 69°C). A good thermometer is the best tool to help you cook the juiciest, most tender, most flavorful meat.
- Browning the meat is essential for full flavor with any of the moist cooking methods. Slow cooking at a low simmer in flavorful liquids gives the best results.
- Today's chicken has high moisture content. Add very little liquid at the beginning of stewing and braising.
- Slow development of *warmed-over flavor* of cooked poultry by thoroughly wrapping when freezing or covering with sauce in storage.

Fish must swim thrice—once in water,
a second time in sauce,
and a third time in wine in the stomach
Old English proverb

SEAFOOD

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Seafood in the kitchen is almost like French pastry—it is quite a challenge to many cooks. While creating French pastries is difficult and it takes enormous experience and know-how, preparing good seafood is easy. It takes only some basic knowledge and a little experience. You need some skill of not only how to cook it to perfection, but also how to buy it, how to store it and how to keep it safe. No wonder cooks are uneasy when it comes to preparing fish. Even the term *seafood* is ambiguous. Do you include edible fresh-water creatures in the seafood category? And if you call it fish, can you include shellfish? In this chapter, for the sake of simplicity, I'll refer to all fish and shellfish, whether from the ocean or fresh water, caught in the wild or raised on fish-farms, with the friendly term, seafood.

More than half of all the seafood we consume in the United States and Canada we eat in restaurants. That's a sure indication that people are either afraid to or don't know how to prepare it at home. Seafood cookery is a love-hate affair for the inexperienced cook—one can quickly ruin it in the cooking process. But with understanding it can be the easiest, most satisfying and most user-friendly entrée in a cook's repertoire.

The Seafood Story

Fish and shellfish in America have gone through more profound changes than any other meat in recent years. Not many decades ago, only those who could not afford real meat ate fish. Almost everyone else ate it on Fridays as a penance, and ignored it the rest of the week. When the cook served it, seafood appeared in the least offensive way possible, virtually disguising it as fish sticks or fish and chips, preferably with least trace of fish flavor or fish smell.

Here is a story to illustrate what I mean. I met a camper on an early morning in New Mexico's Cimmaron Canyon State Park, smiling proudly as his two young grandsons handed him four freshly-caught cutthroat trout that looked to weigh at least a pound (half a kilo) each. Very few foods are worth dying for, but properly-cooked freshly-caught trout comes close, so I asked him with envy how he intended to cook them. "I fillet them first," he explained, "then I heat up the charcoal and grill two boneless sirloin steaks for each fillet then grill the fillets. I pop one fish fillet between two steaks and there you have it—a fish sandwich."

Fortunately, the attitude of many of us toward seafood has improved, mostly because of better knowledge of how to handle seafood to keep it at its peak, better and quicker distribution, more information on how best to cook it, and a shift in focus to foods with health benefits. This all boils down to one fact—today seafood on your plate tastes good. Finding seafood that is fresh, nutritious and good-flavored is not problem-free, especially at the retail level, but we have come a long way, and packers and processors introduce improvements all the time (some of which even benefit the consumer).

Commercial fishing has been a booming industry for years, but the modern version has moved from small and medium-sized operations to 300-foot-long factory ships. Half-a-dozen smaller boats catch fish around the clock and deliver them to the factory ship in enormous quantities where they clean and flash-freeze or ice the seafood, seemingly before the tails stop twitching. We may have some negative feelings about such changes, but there is no denying the wider availability of good-quality fish at reasonable prices in most parts of the U.S. as a result. The quality of the seafood processed on large factory ships is far better than those caught by smaller fishing operators under conditions not necessarily optimal for storing the catch.

Distribution has also improved rapidly since the 1980s. Today's distributors handle both

fresh and frozen fish, but they keep none in storage for long. With an airport nearby, they can fly fresh fish in from anywhere in the world within one to three days. Fresh orange roughy caught in New Zealand yesterday morning can be in Sacramento, California, by this morning and in the fish market or restaurant kitchen by noon. If you buy it within the next few hours, that's a truly fresh fish. If it is still in storage for a week, even under ideal conditions, it loses its freshness but it is still a good fish. If few people order orange roughy at the restaurant or buy it at the fish counter this week, it goes on special next week, no longer fresh in the best sense of the word. The pieces that still didn’t sell by then the seafood department clerk freezes (or re-freezes), and they are no longer good choice for anyone. By this time, only the price is right.

Sea ranching and fish farming encourage today's love affair with seafood. Growing seafood in a controlled environment is called aquaculture, a wetter version of agriculture. In the mid-1980s it produced less than 10 percent of the total fish and shellfish consumed worldwide, but by the mid-1990s, they farmed 15 percent of our seafood. In the eastern part of Asia, where aquaculture is an ancient practice, they raise about 85 percent of the total catch. Fish farming is highly efficient—at a trout farm fish gain between 1.5 and 2 pounds (700 to 900 g) for every pound (half kilo) of high-quality fish food. At a catfish farm fish are able to gain an amazing 1.1 pounds (500 g) for every pound (450 g) of fish food. Not much waste in there. The excess 0.1 pound (45 g) must be for energy.

TASTINGS. **Farmed fish production**
Using a natural environment and supplementing food for the free-swimming fish can produce 80 to 400 pounds (36 to 180 kg) of fish per acre. But intensive fish farming in an all-artificial environment can produce a staggering 160,000 to 1.6 million pounds (72,600 to 726,000 kg) an acre. Introducing oxygen into the water increases yield even more. A fish hatchery in Northern California, for instance, raises 40,000 trout in each of the octagonal pools mere 40 feet (12 m) in diameter with added liquid oxygen from a tank. Circulating water keeps the trout gently swimming against the current (like being on a treadmill) to build firm and solid muscle that guarantee excellent quality fish.

Seafood Nutrition

All seafood is high in protein but not quite as high as poultry or red meat. On the average, 19 percent of seafood is protein. Shellfish meat contains a little less protein, with an average of 16 percent. In a serving size of 4 ounces (110 g), this translates to 22 grams of protein for fish and 18 grams of protein for shellfish. Seafood is also very high in minerals and vitamins. It contains a little less cholesterol than meat or chicken. The average fish has about the same amount of cholesterol as a lean piece of beef or a skinless chicken breast. A serving of 4 ounces (110 g) of seafood only contains between 50 and 80 milligrams of cholesterol. If you're watching your cholesterol intake, be aware of these exceptions (all given for 4-ounce or 110 g servings):

Lobster	106 mg
Crayfish	157 mg
Shrimp	173 mg
Squid	263 mg

The real health benefit of eating seafood is its much lower saturated fat content. Seafood contains high polyunsaturated fatty acid (called omega-3), which nutritionists consider important for people susceptible to heart and blood pressure problems. Even though many people switched to seafood for that reason, more recent research published in 1997 disputed the cardiac benefits of omega-3 fatty acids. Nevertheless, seafood is still a good, healthy fare.

It is harder to determine how much fat is in a serving of seafood than in the meat of domesticated land animals. The animals we raise are on controlled diets so the fat content of the meat or seafood that reaches our plates is fairly constant for a specific cut of meat. That's not true for seafood they catch in the wild. The same species of fish can vary considerably in the amount of fat depending what the fish have been eating or the life cycle they are in. The cod steaks you bought three months ago may have been very lean, but when you look at cod in the supermarket today, you see a layer of fat between the skin and the flesh. What we know as a lean fish may be much fatter just before spawning season. Herring, for instance, may contain only 5 percent fat one season but 15 percent in another. In general, farm-raised seafood has slightly higher overall fat content than the same species caught in the wild and does not very with its life cycle.

There is more fat stored in some parts of the fish than in others. The liver always contains a lot. Muscle, the fleshy part we eat, has fat within the fibers similar to marbling in beef. Fat also surrounds fish muscles, just like in red meats, but in lesser amounts. In red meat the surrounding fat is easy to see and you can trim it. In seafood it is harder to see and cut out because it is very similar in color and texture to the meat.

The good news is that, overall, seafood have less of the unhealthy type saturated fat, and more of the desirable type, polyunsaturated fat, than other meats, and that makes fish a "hot" item for people who are concerned about their fat intake and cholesterol levels. This isn't such good news for the cook, because it is polyunsaturated fat that makes fish spoil much faster than other meats. It turns rancid quickly.

Seafood also contains many important micronutrients, particularly iodine, that people living far inland used to lack before the days of iodized salt. The introduction of fish on Fridays, in fact, had significant health benefits in restoring the body's iodine needs, provided the fish was not from fresh-water source.

TASTINGS Is it oil or fat?
Some cookbooks use the term "oil" instead of "fat" when referring to fish, "oily fish" instead of "fatty fish." The only difference is in the spelling. They are both the same. The reality is that when you cook the fish, the fat in it melts and becomes oil.

Help! What Kind Should I Buy?

The first skill you need to develop is what to buy. Most cooks stick with fish and shellfish they know, and they are influenced by price, what's on sale and what looks good under the tightly-wrapped package or behind the glass counter. Sometimes, we look for that wonderful seafood the waitress served us last month in that chic restaurant.

Most kinds of seafood have more than one name. And what you find in the seafood display changes from season to season, but at any one time you can find a dozen or two different

kinds of seafood. I'm going to point out some things that will help you make intelligent choices even if you are not an ichthyologist. The tables at the end of this chapter give you all the reasonably common fish and shellfish you are likely to find at the market, with a brief description useful to the cook. Three tables list fish dividing them into three groups according to their fat content, and a fourth table lists shellfish. You may want to print these tables and take them with you on your seafood buying trips.

Classifying seafood for the cook

A biologist's approach of classifying seafood doesn't help you in the kitchen. You need a practical method of categorizing the scores of fish in a way that will help you make good choices at the fish counter. The number of systems used in culinary literature are dizzying, many of them confusing and inconsistent, as unclear as the mud that bottom-dwelling carp-suckers inhabit. Since our interest is strictly in cooking, our most useful approach is to catalog seafood that relates to cooking and eating.

First, let's divide everything into two categories—fin fish and shellfish. Even though when you purchase fish you may not see either part, every cook has a basic sense of which fits into what category.

How to classify fish

The fin group, commonly known as fish, naturally divide into two major subgroups—round and flat. You can usually find both kinds at the fish counter, though round fish are far more common. They have the familiar fish shape, a central backbone from which the thinner bones of the rib cage radiate outward. Trout is a good example.

Flat fish look like round ones that have been stepped on from above and flattened out. The backbone remains in the center, with rib cage bones spreading along a flat plane instead of radiating in a semi-circle. Sole is a good example. If you have the opportunity to see a whole flat fish, you'll see that the two eyes are on top of the head of a flat fish rather than one on each side. Though may look odd, this makes sense since these fish swim and feed near the ocean bottom, so they need to keep track of what is approaching them from above with both eyes. Where the eyes are is not important to the cook, but the shape of the fish and where to find the bones is.

So far, the cataloging has been simple. The real problems begin with further subdivision. In today's health-conscious world, the fat content seems a more useful characteristic. Knowing the amount of fat not only helps you choose the best cooking technique for that specific fish but also indicates the amount of flavor you can expect and how long it will stay fresh on ice. This natural division gives us three categories—lean, medium fat and fatty. Here's the amount of fat in each of these subdivisions:

- Lean fish—up to 3% fat (less than 3.4 grams in a 4-ounce serving)
- Medium-fat fish—3 to 8% fat (3.4 to 9 grams in a 4-ounce serving)
- Fatty fish—greater than 8% fat (more than 9 grams in a 4-ounce serving)

TASTINGS How restaurants classify fish

Restaurateurs have a whole different approach to classify their seafood. Irrespective of fat content, where they came from or what group they belong, they simply and practically put them in two gangs—dinner fish or lunch fish. Dinner

fish are high-quality and rich-tasting, or any fish in fashion (the reasoning behind this last category is hard to define). All others they call lunch fish.

The tables at the end of this chapter divide fish by fat content. A well-stocked fish market carries all three types, although not all at the same time. It varies by season and availability. A small fish counter at your corner supermarket carries only a small selection of common varieties, depending on space and local demand. Not included in the tables are the hard-to-find varieties, or those that occur only in limited local areas. I've thrown in a few of the more exotic species for those of you who prefer to do your fish experimenting in good restaurants.

You can order just about anything you want in a good fish market, given today's elaborate and efficient distribution system. What distributors stock and offer to retailers changes somewhat from year to year. Certain species disappear or become overpriced, and some new species surface. You’ll find some species only in high-priced restaurants or exclusive clubs, like you would prime-grade beef..

TASTINGS Skates and sharks

Skates, like sharks, belong to a group of simpler sea animals that preceded fish in evolution. Instead of bones, a cartilage structure, that the cook can easily cut out, supports their bodies. Because of their primitive nature, the fresh meat quickly becomes too high in ammonia. Soaking it in either salted or acidified water for a couple of hours (¼ cup salt or 2 tablespoons vinegar in a quart or liter of water) neutralizes the ammonia. If the raw fish you brought home doesn't smell like ammonia, don't bother soaking it.

Some high-demand fish come in different grades, just like beef. This is not obvious at the supermarket where tuna, for instance, is simply labeled tuna with maybe the species name attached (for instance, bluefin tuna). At the wholesale level, tuna comes in three different grades, with the top grade labeled Number 1. The difference in price is substantial. Number 1 sells for about twice as much as Number 3. Number 1 goes to white-tablecloth restaurants, occasionally to classy fish markets. You can buy the next two grades in the seafood departments of supermarkets and at other fish markets.

TASTINGS From salmon to lox

Atlantic salmon was once the fish of choice for such ethnic delicacies as lox, nova and kippered salmon. The supply of Atlantic salmon has declined, so now we have to resort to one of the Pacific salmon species for these traditional preparations.

More fish facts

Flounder and sole, both common flat fish, are so similar in appearance, flavor and texture that wholesalers market the two species as one, with a free interchange of the various common names. Buying a flat fish under one name doesn't promise what you're actually getting, but as long as you are neither a marine biologist nor a purist, it doesn't matter for culinary purposes. Halibut is the third major group of flat fish, but it is actually a member of the flounder family. You usually find flat fish in retail packaged dressed whole or in fillet form. Occasionally a large

flounder or halibut is so thick that the fish monger can cut it into steaks.

Sole has many aliases that vary from coast to coast. No matter what the name, you can cook them all the same. The flavor, however, ranges from excellent to mediocre. The famous petrale sole is at the top of this family for flavor, with rex sole a close second. When you see a fish labeled merely "sole," it is likely to be a more common and somewhat inferior type, usually English sole. True Dover sole is an Atlantic and Mediterranean fish, prized in France and England, and is imported into American and Canadian markets both frozen and fresh. To confuse you even more, fish processors also use the name Dover sole for a common Pacific sole of only fair quality. When buying Dover sole, ask where it grew up. That means you have to buy Dover sole in a fish market where you know the person behind the counter is knowledgeable.

Mahi-mahi, a dolphin fish from Hawaii (no relation to the mammal dolphin), does not lend itself to common high-volume commercial fishing methods because it is such a fast swimmer. It is hard to catch in big commercial nets. Fishermen catch it with the old hook-and-line method. The high price is attributable to a larger demand than supply, not necessarily to its superb quality (though mahi-mahi happens to be delicious).

You can cut skate meat (they also call it skate wing) with a cookie-cutter-like kitchen tool to make scallop-shaped chunks that fish retailers substitute for the real thing at a much lower price. Only a fanatic would notice that the grain of the meat in scallops is vertical when the disk sits on your plate, while the skate grain is horizontal. Their flavor is very similar.

TASTINGS What's in the tuna can

The canning industry in the U.S. uses all the tuna we don't consume fresh. Albacore is firm, white, and mild, and you find it in the market as the higher-priced canned white tuna. Tuna that is not as light in color and stronger in flavor fills up the rest of the cans on the shelf. They reserve tuna for pet food, that has too strong flavor or too dark color for most human palates.

The darker the color of fresh tuna, the stronger the flavor. If you prefer your fish mild-flavored, this is likely to be too strong for you. To tone the flavor down, soak it in chilled brine (½ cup salt in a quart or liter of water) for an hour, or until the color turns light, to leach out blood responsible for the aggressive flavor.

TASTINGS Why is carp ignored?

Carp is an excellent fish to eat, well-regarded virtually throughout the world, but it is neglected by North Americans. This may be due to lingering bad press. A program to eradicate it was launched shortly after carp was introduced into the U.S., because it was wrongfully thought to be a threat to indigenous species. You can find carp in some ethnic and regional seafood markets in the U.S. The starting material for the Jewish gefilte fish is carp, sometimes mixed with pike and whitefish. The Chinese have aquacultured carp for at least 2500 years, and it is also aquacultured in Europe.

How we classify shellfish

Shellfish are easier to subdivide than fin fish. Marine biologists divide them into two main categories:

- Crustaceans—this is where the four most important culinary shellfish belong—shrimp, lobster, crab and crayfish.
- Mollusks—this includes every other shellfish that has ever showed up in the kitchen, alive or dead.

This classification is strictly for general information. Since it has no culinary significance, you don't need to remember what is a crustacean and what is not. But it is handy to know what the terms refer to when you run across them in a cookbook.

There are 13 species of shellfish at markets and all are low in fat. Most are often available seasonally but not all are available in every region of the U.S. and Canada.. Look at the shellfish table at the end of this chapter for a description of each one.

Getting acquainted with shellfish

Here is some additional specific information about each of the 13 species of shellfish that you are likely to find at the fish market.

Abalone is a large single-shelled mollusk with a proportionally large creamy white, firm muscle that has a mild and wonderful flavor. The muscle that cooks commonly cut it into slices as steaks, is tough and rubbery when fresh and needs some tenderizing, either in a tenderizing bath or with a meat mallet.

This mollusk was in high demand in the 1970s and as a result fishermen severely overfished it. It virtually disappeared from markets through the 1980s, but aquaculturing abalone began in the 1990s. You're still not likely to find it in any but the most exclusive seafood markets. It is a slow-growing mollusk (takes four years to develop 3½ ounces or 100 g of meat), and the appetite for abalone, especially in sushi bars in Japan, is insatiable. Expect to pay $40 to $50 a pound (half a kilo) (U.S. price in late 1990s), including the shell!

Count on 4 to 5 ounces (110 to 140 g) of abalone meat per person. About 30 percent of abalone in the shell is edible meat.

Clam is a bivalve mollusk. This means its shell has two halves, and the muscle that holds them together is the one we love so much. You can buy clams live in the shell, shucked (which means they have been removed from the shell) or pasteurized in cans. Live is the best choice if you don't mind the extra work of shucking. Steaming in a large pot loosens the grip of the muscle and the shells fall open. The best indication of a live clam is a tightly closed shell.

The major culinary division for clams is soft-shell and hard-shell (this one is also called quahog). The names refer to the thickness of the shells. Soft-shell varieties have shells so thin that you can push your finger right through them. The hard-shell varieties, on the other hand, are so thick you may need a hammer to break them. The best way to prepare soft-shell clams is to steam or fry them. You can eat small hard-shell clams raw. If they are large, processors chop or mince them and use them in a preparation like chowder. Different kinds are available in different areas, but within the two major categories, you can substituted them for each other.

Occasionally you come across cockle, a species of clam. It may incorrectly be called winkle, a shortened name for periwinkle, which is an edible snail-like mollusk not commonly available. Cockles are far more popular in Europe and Southeast Asia than in Amercia.

TASTINGS The clam clan

There are eight species of clams in commerce, one of which is a fresh-water variety. At the market, however, you won’t find them labeled by name but rather

according to size:

♦ littlenecks—8 to 14 in a pound (18 to 37 in a kg) (these are 3 to 4 years old)

♦ topnecks—5 to 7 in a pound (11 to 15 in a kg)

♦ cherrystones—3 to 5 in a pound (7 to 11 in a kg) (these are about 5 years old)

♦ chowders—2 to 3 in a pound (4 to 7 in a kg) (these are large, older, tougher clams and the meat is only edible ground or minced)

Only 20 to 30 percent of the gross weight of clam in the shell is edible meat, more for larger clams, less for smaller ones. The giant geoduck clam (pronounced GOO-y-duck) for instance, is 70 percent edible muscle.

For most clams, 6 to 8 shells per serving is enough but ask the clerk if you are unfamiliar with the specific clam you are buying. Geoduck, however, has so much meat that count on 5½ to 7 ounces (160 to 200 g) of weight, including the shell, per person. Geoducks are huge, some weigh over 5 pounds (2¼ kg).

TASTINGS Clam juice, broth and nectar

Clam juice is the liquid that accumulates in the shucking operation. **Clam broth** is clam juice diluted with cooking water. **Clam nectar** is the cooked-down concentrate of clam juice.

Conch (pronounced KONK) is a single-valved mollusk. It is locally available along south Florida shores and in the Caribbean, though you may find it in some restaurants in other areas. It is the large muscle of the foot that is edible, and it needs tenderizing, like abalone, or cooking it as ground meat. The flavor is mild, suitable for salads and chowders. Count on 2 or 3 conchs per serving or, if already shelled, 4 to 5 ounces (110 to 140 g) of meat.

Crab is one of the three most popular shellfish consumed. There are 20 commercially significant crabs species, eight of which are common in North America. In some species we use the claw meat mainly. In others, it is the body meat, and in a few it is the leg meat that is prized. Fresh crab is an excellent meat, but the canned variety is in an entirely different league. Raw crab does not freeze well, so when you see frozen crab, it had been cooked or otherwise processed. Frozen crab can be very good.

The versatility of this shellfish contributes to its popularity. Different species have different textures, and some lend themselves more to certain cooking methods than others. In the kitchen, crab is in three main categories:

- Lump meat is a solid chunk of meat from the crab's body. Use it in dishes where appearance is important.
- Flake meat is smaller pieces from other parts of the body, not as wholesome in looks as lump meat but still suitable for most crab recipes.
- Claw meat comes in still smaller pieces. Use it when appearance is not critical, such as in soups and in some salads.

Blue crab from the eastern U.S. is the most common species. Like all crabs, blue crab sheds its shell when it runs out of room. The new shell grows in just a few days, but while that is taking place, the crab is very vulnerable to predators. During those few naked days the rest of the crab, including the meat, also grows very quickly. This is the ideal time for human predators to

nab them, having extra meat and very little shell to fight on the plate. These are called *soft-shell crabs*. Experienced crabbers and distributors separate out crabs that are about to shed their shells (they tell by a reddish coloration) and market them at premium prices as soon as the old shell comes off.

About 25 percent of the total weight of a crab is edible meat. In the shell, 1 to 1¼ pound (450 to 570 g) of live crab per person is a generous serving, or 4 to 5 ounces (110 to 140 g) of crab meat if you buy it shelled.

TASTINGS What is imitation crab?
Imitation crab is a commercial preparation called *surimi*, that the Japanese invented and used for at least 800 years. Originally, it was a way of preserving extra fish when fishermen had a big catch. With modern technology, fish processors produce surimi from inexpensive and abundant fish, either whitefish, pollock, tilapia, hake or menhaden (menhaden is a nonfood fish that's used mostly for bait, fish oil or fertilizer). They clean the fish, then force it through a perforated grid that strains out bones and skin, ending up with a mince that they quickly freeze in large blocks at sea. This is the base for imitation crab, shrimp, lobster, scallops and even salmon. To make it look authentic, they also add flavor, color, crab and shrimp by-product juice, and chemicals. This substance is restructured to resemble the texture and mouthfeel of the real thing. It is inexpensive, which is its main virtue, although it is also reasonably nutritious. It has very little flavor and undedicated cooks and lower-priced restaurants often use it in salads, since it looks good and there is absolutely no preparation involved. Open the package and dump the small chunks into the salad bowl. People eat more surimi imitation crab in the U.S. than real crab, not surprising when you compare the prices. In a supermarket that carries Dungeness frozen crab meat at, for example, $23 a pound (450 g), imitation crab sells for $3 a pound (450 g).

Crayfish, **crawfish** and **crawdad** are interchangeable terms in the fish trade, but technically they are not the same animal. Crayfish is a small freshwater species in the Pacific Northwest that looks like a miniature lobster. Crawfish or crawdad is a large marine species that looks and tastes like lobster but is not closely related to it. Crawfish and crawdad are the terms of choice in the Southeast. Crayfish is as delicious as lobster, but it only grows large enough to be easily edible in a few areas. Now they farm crayfish and is often available where there is demand for it.

In crayfish 15 to 20 percent of the total creature in the shell is edible meat. When you buy it in the shell you need 1¼ to 2 pounds (570 to 900 g) per person, depending how meaty the crayfish is, or 4 to 5 ounces (110 to 140 g) of shelled meat.

Langostino is a small member of the lobster family caught off the Chilean coast. The tail meat, picked from the shell by hand, cooked and frozen is highly prized. This meat looks like small shrimp and tastes like lobster, but with a more delicate flavor. Its color is a brighter orange than lobster's. A similar species, called lobsterette, lives off the coast of the Caribbean and south Florida, as well as in southern Europe. Retailers use the two names interchangeably. Look for these in the freezer, either individually quick frozen or in bulk. They are moderately priced compared to lobster.

You'll find langostino marketed without tail so all is edible meat. For cooking, count on 4

to 5 ounces (110 to 140 g) per person.

Many people consider l**obster** the king of all shellfish, and some think that it should be listed on the menu in Heaven. The fact is that not everyone is willing to die and go to Heaven for it. In fact, not many are willing to pay the high price for it. A good lobster is indeed a treat, but not all lobster is good, and many discriminating seafood eaters feel it is overrated. Both scarcity and its image as a luxury seafood help keep lobster prices high.

Most think of lobster not only of a luxury food, but also as a very rich food, yet it only has a moderate amount of fat. Having such high esteem, chefs often prepare lobster to sparkle in appearance and flavor, which means loading it up with butter and sauces in the traditional French manner. Those additions are what make lobster rich, not the meat itself.

You can eat every part of a lobster but the shell. You can serve its tail, the white body meat and the claw meat in the shell right from the steamer. Chefs customarily use the *tomalley*, which is the unique-flavored green liver, and the *roe* (also called *coral*) in sauces. Actually, ambitious chefs even take advantage of the beautiful shell coloring by extracting its carotene pigment and using it as natural food coloring.

Like crab meat, fresh lobster does not freeze well (its texture suffers), but after blanching, the frozen and thawed meat retains its quality and texture well.

We have two important lobster species in the kitchen, one is named European and the second, much larger, American (or Maine) lobster. We also have the small spiny lobster, which is not a true lobster but a relative of the crayfish.

A live lobster in the shell yields 25 percent edible meat, same as a dead one. Serving sizes are same as crab: 1 to 1¼ pound (450 to 570 g) in the shell generously serves one person or 4 to 5 ounces (110 to 140 g) of raw lobster meat.

TASTINGS The lobster grades

There are four grades of lobster in markets graded by their sizes:

- ♦ Chicken—less than a pound (450 g)
- ♦ Quarters—1 to 1½ pounds (450 to 570 g)
- ♦ Large—1½ to 2½ pounds (680 to 1140 g)
- ♦ Jumbo—greater than 2½ pounds (1140 g)

Mussel is a bivalve with meat that varies from pale tan to a deep orange in color. It has a tangy or smoky flavor. Like eel, mussels are much neglected in the U.S. but highly valued in Europe where they are actually farmed. In the right season mussel meat is excellent. During spawning, the flavor is less desirable, the amount of edible meat is less and it could be bitter. One species, the blue or edible mussel, is by far the most commonly available, but some markets may also offer the greenshell mussel from New Zealand.

Like clams, your best bet is to buy mussel live in tightly closed shells. If you can slide the two shells past one another, the muscle of the mussel has relaxed, signifying that the animal is dead. Skip these and those with shells gaping open. Once the shell opens, clams and mussels dehydrate rapidly. Can't find mussels for a recipe? You can substitute clams or oysters—different flavor but they behave the same in the sauce pan..

Mussels are now farmed. The cultivated ones have a milder flavor, but tight control over harvesting and distribution attests to their freshness.

About 40 to 50 percent of in-the-shell mussels' total weight is edible meat. Six to 8 shells serve a person or 4 to 5 ounces (110 to 140 g) of shucked mussel meat.

TASTINGS How fresh is that shellfish?

Regulations in the U.S. require that the processor tags all live shellfish that is for sale in retail markets. When they arrive, the fish market clerk takes the tag off, and files it for 90 days in case of illness from the shellfish. These tags indicate where and when they harvested them. Don’t be timid to ask the clerk to see these tags when you buy shellfish, if you doubt their freshness.

Octopus is a delicacy in high regard in the Orient. It is less highly regarded in North America, probably for the same reason eels and snakes aren't often on menus here. None of them look very pretty when alive. (Neither do pigs, you could argue.) Octopus has a delicate, firm, sweet white meat so high in quality that the Japanese even use it in sushi.

Octopus is particularly vulnerable to dry heat, which turns it into something resembling a piece of bread dough you have forgotten on the counter for a day. It does better when simmered for longer periods of time in stew-like preparations. In quick-cooking methods it is best if you tenderize the meat before cooking, especially if it came from a large (over 2½ pounds or 1140 g), older animal. You can buy octopus in cans, too, but don't bother sampling it. The flavor is very poor compared to the real thing.

Eighty percent of the original dressed weight of octopus is edible meat. You’ll find it in the market dressed, cleaned, eyes and other inedible parts removed, and each weighing about 3 or 4 pounds (1360 to 1820 g). The amount to buy is 4 to 5 ounces (110 to 140 g) of meat per person.

Oysters are not for everyone, but the minority who likes them is unconditionally passionate about them. Other folks consume oysters in large quantities simply because of their reputation as an aphrodisiac. All this aside, oysters are a real delicacy, particularly when the host or hostess serves them *au naturel*, or raw. Since uncooked meat of any kind has little or no flavor, traditional condiments and sauces usually accompany raw oysters, in which the texture and mouthfeel give the eating pleasure more than the flavor.

Oysters change flavor drastically during spawning season. They accumulate *glycogen*, a starch which turns the meat milky and the taste starchy and bland. Their meat also contains a higher amount of fat during spawning season. The old wives' tale about eating them only in months with an "r" in their names works because those r-less months correspond with the spawning season. If the weather is cooler than normal, though, oysters retain their spawn and the flavor continues bland. It pays to look at both the calendar and the weather pattern before choosing an oyster recipe for the next dinner party.

You can buy oysters fresh in the shell, freshly shucked, or individually quick frozen. If you buy them shucked, make sure the liquid in the package or container is clear—this indicates freshness. You buy oysters in the shell by size—small, medium and large. Very small and extra large sizes are also available, but these are mostly sold to restaurants.

Of the six commercial species, three are common at retail or in restaurants. The highest quality Olympia oysters, from the Northwest, are larger and not quite as flavorful as Pacific (or Japanese) oysters, and finally the Eastern oysters, which you find most readily. Serve oysters cold (raw or cooked) on the half shell on crushed ice with lemon or dipping sauce in a small bowl on the side. If you are serving them hot, display them on a bed of hot coarse salt (the salt keeps the tiny creatures hot).

Edible yields vary a great deal, depending on the size and thickness of the shells and the

size of the oysters. It is anywhere from a mere 5 percent for thick-shelled, small oysters to about 15 percent. If you buy oysters in the shell by the number, count on 6 to 9 per serving or if you buy them shucked, 4 to 5 ounces (110 to 140 g) by weight or 6 to 8 ounces (180 to 240 ml) by liquid volume.

Scallops have firm, ivory-colored meat that can be divine if not overcooked. The flavor is sweet, nutty and delicate. They are readily available in seafood markets, but they must be absolutely fresh to be good. Everything between the two shells is edible, although in North America people opt for the single large adductor muscle only. Unlike clam shells, the two halves of a scallop shell don't completely close. They dehydrate quickly after harvesting and die if the fishermen don't keep them in optimum environment. Because they are so perishable, processors often clean scallops on board the fishing vessel and keep them on ice. They are not as easily available for harvesting as shrimp. The fishermen must catch enough to make it worthwhile to bring them into port, so those unfortunate ones they caught early may be shivering quite a while on ice before they haul the last ones in.

Storing scallops in fresh water improves the all-important appearance for marketability. Unfortunately for the consumer, this also increases weight and dilutes flavor.

Individually quick-frozen scallops retain their freshness, flavor and moisture well, and you often get a better buy and quality than fresh ones when you cannot validate just how fresh is fresh. Distributors usually soak scallops destined to sell as fresh in a chemical *(sodium tripolyphosphate*) to retain moisture and improve appearance. They may look great but be wary—the chemical alters the flavor and you might think of wandering over to the frozen counter instead.

Stores commonly sell two major species of scallops, the small and more delicately flavored bay scallops and the larger, more abundant and nearly as good sea scallops, which are much cheaper. Tiny calico scallops from Florida are very uncommon. They resemble bay scallops but supposedly don't have as good a flavor.

The scallops at the market are pure meat, you only lose the liquid it releases on cooking. Count on 4 to 5 ounces (110 to 140 g) per person.

Shrimp is without doubt our most popular shellfish and among the most popular of all seafood. With its firm meat (when not overcooked) and delicate, distinctive but not overpowering flavor, even diners who never choose seafood from a menu may order shrimp (provided there's some juicy red meat on the plate next to the shrimp). A dozen different species of commercially important shrimp grow in various parts of the world. With modern air transportation, we have access to all of them. Flavor has nothing to do with size, but restaurants prefer the large shrimp, because they are easier and faster to shell and look very showy on the plate. Diners are also willing to pay extra for colossal and jumbo sizes.

Sizes vary tremendously. Really tiny shrimp weigh less than one-tenth of an ounce (3 g) each (the weight of a clove of garlic), while the giant species weigh in at about half a pound (225 g), too much for one serving.

A significant amount of imported shrimp is now coming from Asian shrimp farms, where they harvest and immediately flash freeze them, then ship by air all over the world. Shrimp are so perishable that they must freeze them immediately after they leave the water. If the shrimp you brought home from the store turns out not very good, blame it on the handling somewhere between the water and your plate. (Or blame the cook.) It is the underpaid retail store worker that knows the least about handling and storing to preserve flavor. Your best bet is to buy shrimp frozen, if you can find it packaged in the right quantity, and defrost it yourself. (See suggestions

on storing later in this chapter.) Retailers generally buy shrimp in four-pound boxes, that are only occasionally displayed, but you can request a full frozen box. Asian markets always have them in the freezer case. The fresh-looking shrimp on display at the fish counter are not fresh—the clerk defrosted them just a few hours before you arrived. Usually the only way you can buy fresh, never-frozen shrimp is from fishing boats just pulling in.

Don't ever buy pre-cooked shrimp. Cooking shrimp is almost as easy as cooking potatoes, and you can do a far better job than the supermarket's underpaid cook in the back.

Best Way to Cook Shrimp

When you are planning to use shrimp cold, it is best to cook them soon after purchase. Cooking kills microorganism and deactivates enzymes, both of which speed deterioration. Once cooked and chilled, the shrimp's shelf life increases considerably.

Cooking shrimp is easy, but cooking for the perfect, succulent flavor and juicy, firm, toothsome texture takes a good recipe and good method. I tested many, many recipes from different sources and finally chose two that are quick and easy and result in firm but not dry shrimp, that retain their flavor instead of releasing it into the cooking liquid. The first method is particularly quick, but the second one has added flavor from spices in the cooking liquid. From beginning to end, the first method takes 10 minutes, the second one 20 minutes (not including cleaning the shrimp).

Remove shells from shrimp. The most efficient way is to pop open the shell from its belly with your thumbs, as if you were removing green peas from their pods. Pull the shell apart and peel it off the shrimp. If you are planning to leave the tail on as a handle, pinch the tail with your fingers, and stop peeling when you reach your fingers. Pull off the rest of the shell. Devein if you wish.

Method 1

1. Place shrimp in a bowl and barely cover them with water. Drain and measure the amount of water then pour it into a pan. Stir to dissolve 1 tablespoon salt for every quart (liter) of water. Bring the salted water to boil.

2. When the water is at furious boil, take the pot off the heat, dump the shrimp in the water, stir lightly with a spoon and cover. Set your timer for 5 minutes.

3. Drain the water and quickly chill the shrimp in cold running water. Drain again and refrigerate.

Method 2

1. Place shrimp in a pot and barely cover with water. Drain and measure the amount of water, then return it to the pot. Add 1 tablespoon salt, 1 bay leaf, 1 teaspoon peppercorn, ½ teaspoon dry thyme and ¼ cup white wine for every quart (liter) of water. Pour the seasoned liquid (which is a simple *court-bouillon*) over the shrimp in the pot.

2. Cover the pot and bring water and shrimp to boil on high heat. Watch the pot. As soon as you see steam escape, pour the water off. Replace the cover and let shrimp sit in the steam for 10 minutes.

3. Chill the shrimp in cold running water. Drain and refrigerate.

Commercial shrimp comes in 11 different sizes, but you are likely to see only five or six at your fish counter. The largest ones go to restaurants whose patrons can afford to pay for them, and the really small ones end up in various commercial preparations. The table below gives you the ranges for each size. The numbers show how many shrimp make up a pound (or a kilo).

TASTINGS Commercial American shrimp sizes

Shrimp size	**No. in a Pound**	**No. in a kg**
extra colossal	less than 10	less than 22
colossal	10-15	22-34
extra jumbo	16-20	35-45
jumbo	21-25	46-55
extra large	26-30	56-66
large	31-35	67-78
medium large	36-40	79-88
medium	41-50	89-111
small	51-60	112-133
extra small	61-70	134-154
tiny	more than 70	more than 154

Some cooks claim that shrimp have extra flavor when they cook them in the shell. This is questionable, and serving fresh-cooked shrimp in the shell is unkind to your guests. Peeling them is a messy operation at the dinner table, painfully so for people who have no experience. It is more considerate to shell them in the kitchen, cook them quickly, and serve them piping hot.

If you are using large shrimp, you may want to devein them, too. The vein that runs along the outer curve of the shrimp is the gut. It is small even in large shrimp, but some folks consider it unappetizing to look at. I never bother with deveining. Serving shrimp in a sauce masks the vein. Eating the vein is not harmful. When you eat a whole clam, oyster, or snail for example, you never remove that same portion and never think of the gut that is part of your bite.

The terms shrimp and prawn are interchangeable. The English call everything a prawn, the Americans everything a shrimp, and the Asians traditionally call the larger ones prawns and the smaller ones shrimp. Restaurants prefer prawn when naming their dishes—it simply sounds more elegant and more distinctive than shrimp.

About half of the total weight of shrimp in the shell is edible meat. Purchase 8 to 9 ounces (225 to 255 g) or, if you buy peeled shrimp, 4 to 5 ounces (110 to 140 g) per serving.

TASTINGS What is rock shrimp?

Rock shrimp is a relatively new introduction to the world market (early 1980s). They live dominantly along the southeast Atlantic coast and in the Bahamas but fishermen disregarded them until recently because they have an awfully thick shell that is troublesome to peel off. But someone introduced a new shell-cracking device, and rock shrimp has become a commercial success.

Squid is also called **calamari**, and even though it is not highly popular in the U.S., trendy

chefs who specialize in Asian-influenced cuisines list it on their menus more and more frequently. With its tender white meat, it is a delicious seafood if you properly prepare it, and it is proving to be a popularly ordered seafood in restaurants. Squid is very similar to octopus with comparable flavor and texture, though they don't look the same, the two are from different families. All they really have in common is the black ink.

Like octopus, squid has been very popular in Asian and Mediterranean cuisines for centuries. Serve the small cigar-shaped squid whole or stuffed; deep-fry or pan-fry the tiny few inches long squids, and cut the larger squids into rings or bite-size pieces.

You can count on 70 to 80 percent of the squid you buy at the seafood counter as edible meat, but if it is cleaned, inedible parts removed, there is no waste, and 4 to 5 ounces (110 to 140 g) per serving is generous. If the mantle, head and pen (a primitive shell) are still on (you can ask the clerk), buy 6 to 7 ounces (170 to 200 g) per serving. The canned varieties are hardly worth trying.

TASTINGS Squid ink for writing?
In case you ever need it, you can order squid ink from a good fish market (about $3 an ounce or $9 for 100 ml in late-1990s). You can use it as a natural black dye to make black pasta for a great Halloween dish, or as a dye for any dish you want to serve black for a change. In Spanish cuisine, the cooks add the ink to the sauce they cook the squid in. The dish is a striking, glamorous jet black creation.

At the Fish Market

Is that seafood fresh?

No matter how much you know about seafood, there are two hazards that are difficult to avoid—the freshness of the seafood you are buying and the correct labeling. Let’s tackle the first, how fresh that seafood is.

Specialty books about seafood and cookbooks suggest that you smell and touch the meat before buying it. Fresh seafood only have a mild, pleasant, sweet barely fishy scent and is firm to the touch. Of course, if it is packaged, as it usually is in the market, you cannot tell if it smells fishy until it long past fresh (and smells through the wrapper) and touching through the wrapper doesn't tell you much. Mild poking is still possible, and this can give you some clue. Fresh seafood have resilient flesh that bounces right back when you give it a gentle poke. If your finger sinks in, let someone else take that package home.

If the fish sit on ice in the glass case, you cannot really ask the clerk behind the counter to let you touch and sniff that rockfish. We have left with such advice from bygone days when consumers traditionally bought fish at the open-air market at dawn. Today we have to rely on our visual sense and previous experience in buying fish from the same source.

A survey by the non-profit Consumers Union (1992) looked at seafood contamination. Bacteria counts in a large percentage of samples taken from a variety of retail markets far exceeded acceptable levels, indicating the fish was either old or poorly handled. Cooking kills bacteria, so you are not risking getting sick most of the time. What you are risking is a disappointing meal, with the fish not meeting your taste expectations. Fortunately for us, this fishy situation has been steadily improving over the years.

Why seafood spoils

Enzymes destroy seafood much more rapidly than they do chicken or other meats. You can actually see the results more quickly. The eyes are sunken, the scales loosen, and the thin layer of natural glossy sheen, that covers the fish turns blotchy and slimy. In more advanced stages you see yellowish patches, that are growing colonies of bacteria. Firm and translucent flesh becomes opaque and soft. Oxidation turns the gills from red to a brownish color. If you cannot find the gills on the fish, chances are the clerk cut them out so the aging is not be so obvious to the shopper. In fact, fishermen often remove the gills immediately when they catch the fish in the wild, as the change in their color is the first sign of aging. Farm-raised fish are apt to arrive at the market fresher than commercially caught fish and they seldom remove their gills.

Can you trust the label?

An excellent six-month Consumers Union survey (conducted in 1992) found that at least one-third of all the fish in the market had incorrect labeling, deliberately or otherwise. Some instances appeared deliberate because inexpensive fish had the label of a more expensive species more often than the other way around. When Consumers Union purchased eight samples of rather costly red snapper from various U.S. markets, for instance, they found that only one was really red snapper. The others were lower quality substitutes. Eight of the 14 sole samples had incorrect labels.

Purposely mislabeling fish is illegal, but the U.S. Food and Drug Administration rarely enforces correct labeling. Many state officials also have concerns with mislabeling, but in general they have little enforcement money, furthermore, cut-up fish is difficult to identify correctly—efforts to monitor correct labeling are minimal. Matching protein signatures in the laboratory is the only valid way of identifying cut-up fish, and sometimes even this method fails because the proteins in different fish may have similar signatures.

The excellent grading system we use for meats and dairy products just is not yet available in the seafood industry with the exception of some high-demand fish. Seafood is one of the least regulated of all foods. The U.S. Food and Drug Administration regulates wholesalers, packers and processors, but no one monitors very much at the fisherman’s level or at storage before processing. Retail sellers are under the jurisdiction of state governments, and it is at this level that most problems exist. Laws vary from state to state with no consistent rules governing even the use of correct names for the many species of fish.

The federal government has issued a fish grading standard, but so far its use is voluntary. A government inspector may grade the fish in the processing plant as blemish-free, wholesome and in good condition, but how the distributor, transport company and retail outlet handle it in the next few days (or weeks) determines its quality when you select it from the fish counter. So when you see the label "U.S. Government Inspected," it is not a guarantee of the current state of the seafood.

You may also see a label stating that the fish in this package was "Packed Under Government Inspection" (PUGI). That means that an inspector was standing by to observe processing and packaging at the wholesale level. Again, this label only promises that the fish left the processing plant in good condition.

We don't have a good way to avoid either of these two problems—freshness and correct

labeling. Buying at a reliable source and using your eyes and experience do help. Established seafood markets are the most likely source for good products. In the U.S., supermarket seafood departments vary from poor to excellent. Find a reliable source for seafood and support it.

Should you be lucky enough to have a good Asian food market near you, check out their seafood. Asian cooks not only recognize absolutely fresh fish, they demand it. Often you will find a variety of fresh fish and shellfish swimming in large aquariums, and you can choose the one you want to take home. The clerk then cleans, dresses and cuts up your pick in a matter of three minutes. The prices are often reasonable, but the drawback is that you may not know what you are buying. The names may be different from the ones you are familiar with, and the staff is not usually able to help to assign the correct English name.

Fish terminology

Steak is a 1 to 1½-inch-thick (2½ to 4-cm) slice cut across the body, nearly always of a fin fish. It includes the backbone that gives support to the steak in cooking. Sometimes they use the name c*entercut* steaks that come from the center portion, these are the largest steaks. You get progressively smaller steaks towards the tail where the fish body narrows. *Nape cut* is a steak that comes from the body closest to the head. Steak is the most versatile cut of fish. You can prepare a steak by any cooking technique you wish.

Fillet is a boneless piece they cut lengthwise along the backbone. Each fish has two fillets one on each side. When the two fillets cut from the two sides remain attached on the back, you have a *butterfly fillet*, if on the belly, it is a *kited fillet*. These two kinds of fillets are twice as big, a nice feature when they are from small fish, and more versatile than single fillets—they are easy to stuff. It takes some experience to cut these double fillets, so let the fish market do the job for you. Cooking a fillet takes more care than cooking a fish steak. Fillet has no supporting bone structure. This rules out several cooking techniques. Having no bones makes it much easier for the diner, though.

Loin cut is the whole uncut center portion of the fish body. This is a large, self-supporting piece, like a meat roast (sometimes they label it fish roast). You can also debone a loin cut.

Markets sell whole fish two ways:

Dressed—they scale the fish and remove the innards, but they leave on the head and tail. You can poach, bake or grill whole dressed fish. If the fish is small, you can even sauté or deep-fry it as is.

Pan-dressed—same as dressed, but they remove the head and tail. This is the way you usually see small fish in the display case, ready to deep-fry or sauté.

How much seafood should you buy?

Dietitians use 3 or 3½-ounce (85 or 100 g) servings (usually weighed cooked; raw weight would be about 3½ to 4 ounces or 100 to 110 g) of boneless fish per person as a guide. That is a small serving, suitable for hospital patients and people on diets. The standard restaurant portion guide is 5 to 6 ounces (140 to 170 g) (raw weight) for a lunch, 6 to 8 ounces (170 to 225 g) for a dinner portion. Your best bet is somewhere in-between 4 and 8 ounces (110 to 225 g) , depending on your diners' appetite and how heavy the overall meal is. A good average serving is 5 to 6 ounces (140 to 170 g) per person for boneless fish. The table below is more specific. Take

it with you when you buy seafood.

Amount of Fish and Shellfish to Buy per Person

Whole fish	¾ pound or 340 g
Dressed fish, bone in	½ pound or 225 g
Fillet	¼ to 1/3 pound or 115 to 150 g
Steak	1/3 to ½ pound or 150 to 225 g
Clams, mussels, live	6-8 shells
Crab with shell	1 to 1¼ pound or 450 to 570 g
Crayfish with shell	1¼ to 2 pounds or 570 to 900 g
Lobster, live	1 to 1¼ pound or 450 to 570 g
Oyster, live	6 to 9 shells
Oyster, shucked	6 to 8 fluid ounces (190-240 ml)
Scallops	¼ to 1/3 pound or 115 to 150 g
Shrimp in shell	1/3 to ½ pound or 150 to 225 g
Shrimp, peeled	¼ to 1/3 pound or 115 to 150 g

Edible Yields of Fish

Whole fish	45%
Dressed fish (gutted, with fins and scales removed)	67%
Fish steaks	84%
Fish fillets	100%

TASTINGS What will it cost?
Is it more cost effective to purchase a whole fish and cut it up yourself or to buy cut-up pieces? Use these formulas to convert the price per pound or gram of whole fish to the price per pound or gram of edible meat.

- For whole fish, multiply the price per pound or gram by 3 to arrive at the price per pound or gram of edible meat.
- For dressed whole fish, multiply the price per pound or gram by 2.5 to arrive at the price per pound or gram of edible meat.

For example, if dressed whole fish costs $3.00 a pound, multiply it by 2.5. The edible meat will cost you $7.50 a pound.

Is fresh or frozen better?

If you can find a good source for fresh seafood, count your blessings and visit it frequently. If you are not that lucky, frozen is always a better bet than either fresh seafood that may have been sitting out too long or, worse yet, "fresh" that has been frozen or defrosted improperly. You cannot rely on labels here either because of lack of regulations and enforcement. U.S. Food and Drug Administration regulations require fish labeled *fresh frozen* to be frozen quickly after harvest. But *fresh frozen* may also mean that the fish was fresh when it was frozen. *Fresh* may or may not mean that it has ever been frozen. *Blast* or *flash-frozen* means

the temperature was reduced very quickly. This is the best way to freeze seafood and meat. It costs a little more but it results in the least damage to the meat. That means juicier, better-textured seafood after thawing.

Most retail stores don't offer much selection in the frozen state because customers prefer their seafood defrosted when they buy it. They want to take the seafood home and have it for dinner. Defrosted seafood gives at least the illusion of being fresh, and they don't have to worry about defrosting it correctly themselves.

By the time you see it in the store, some of the seafood they may have frozen, defrosted and frozen again. But seafood that having gone through several stages of freezing is not always in bad shape. If done properly, the process causes minimal deterioration. For instance, they often flash freeze orange roughy in New Zealand on the boat immediately after harvesting, then they take it to shore, defrost it, fillet it and refreeze it. This fish arrives in the retail stores in excellent condition because processors know and adhere to the proper freezing and defrosting techniques. Even at the retail level your chances are better that they handle frozen seafood properly.

Individually quick-frozen (labeled IQF), then ice-glazed seafood is your best bet from the freezer section. The food processor very quickly blast-freeze IQF seafood often on shipboard shortly after the fishermen pull it from the water, then ice-glaze each piece to cut off oxygen and seal in moisture. Retailers are not set up to duplicate this process. While they can refreeze a defrosted package without your knowledge, they cannot quick-freeze and ice-glaze it. If you can see individual glossy ice-glazed pieces in a package, your seafood should be of good quality.

Frozen vacuum-packed items are also a good choice, the two combined methods hold deterioration to minimum. This is a more costly process fish packers do under ideal conditions, and as long as they don’t get defrosted somewhere along the line, they are likely to be of the best quality.

Fish processors are attempting to convert both retail customers and professional chefs to frozen fish, and they do have a valid point. In many areas, good fresh fish is simply not available. Even if a market is close to a fish farm or commercial fishing area, the freshness still may be dubious because of inexpert handling and storage. After talking with leading fish processors and observing the conditions in which they prepare and store frozen seafood, I have to agree. One of the top seafood restaurants in Seattle, Washington even states on the menu that when fish or shellfish is out of season or they cannot guarantee their freshness, they may serve you fresh-frozen seafood to assure good flavor.

The worst choice you can make is seafood that sat thawed in the display so long that the clerk tossed it in the freezer and reduced the price. You may spot this if the clerk hasn’t repackaged it, otherwise you are out of luck.

Seafood in your Kitchen

Safe seafood

The old proverb, "fish and visitors stink after three days" has a lot of truth to it. Fish is the most perishable of all foods and, if you don’t store it properly, the smell reminds you in a few days. The reasons are both physical and chemical, and have to do with the way fish are built. Knowing this can assure you that you always have safe and fresh seafood on your table. And if the meal doesn’t taste good, you can blame your cooking.

Enzymes in different parts of the fish begin softening and breaking down the flesh

immediately after it dies. Bacteria and oxidation join the enzymes almost at once to speed the spoiling process. Cleaning and washing the seafood as soon as it is out of the water help to reduce bacterial spoilage, but it doesn't slow down the enzymes and oxidation. The only thing works is to quickly reduce its temperature to near freezing, or even lower. This is the critical step that impacts the quality of all seafood more than anything else that happens from the time it leaves its native waters until it is in your hands.

The muscles in seafood stiffen very quickly after death. Quality is highest if the fishermen freeze it before this stiffening sets in, otherwise freezing can actually damage the meat. They harvest farm-raised fish and shellfish under ideal conditions, and if they designate them for the frozen seafood market, the freezing process is virtually immediate. This assures you the quality of frozen farm-raised seafood.

Seafood spoils so rapidly that it is unlikely you get sick from eating it. If it is well-past fresh, your nose gives you warning. It still may be safe to eat if well-cooked, but the flavor is likely to be bad. Once it develops a really strong odor, it is no longer safe to eat, but by then you are on your way to the nearest trash can.

How to store your catch

The seafood industry's motto is: *Keep it Cold*, *Keep it Clean*, *Keep it Moving*. Once you buy fresh seafood, give it the same treatment. If you are planning to use it the same day, you are keeping it moving. If you are planning it to appear on your table in a day or two, keep it as cold as possible short of freezing. Have you noticed how seafood markets do it? If packaged, they keep it in their coolers with the temperature set to just above freezing, around 34°F (1°C). (If you want to check this, you can usually find a thermometer in a display case in a hidden corner.) Most home refrigerators run closer to 40°F (5°C), a little too warm for seafood.

Now look at the fresh seafood display. Everything is sitting on a thick bed of ice—the seafood is at the ideal near-freezing storage temperature. And that is easy to duplicate home. Just set the seafood on a bed of ice in a pan and cover it. This is the best way to keep it for the longest-lasting fresh flavor. The back of the bottom shelf of your refrigerator is the coldest, best spot to store. Drain off melted water and replace ice daily. Fishing vessels keep their catch fresh with the same method for up to 15 days.

The only seafood you should not store on ice are live crabs, lobsters and crayfish. They prefer to be at 40°F (5°C), and they definitely don't want to be set on a bed of ice. Live soft-shell crabs (since they don't have their coats on) opt for an even warmer climate, if they have a choice. They should be between 50° and 55°F (10° and 13°C).

If you let seafood warm up above 40°F (5°C), the rate of deterioration increases rapidly. On a warm day the temperature of a nice thin fillet can rise above that magic number between the time it leaves the fish counter and when you tuck it into your refrigerator at home. Either take a small cooler along with ice in it when you go shopping, or buy a small bag or two of some frozen food that you can keep next to the fish on the way home.

To keep the seafood clean (the second part of the motto), handle it is little as possible and only with absolutely clean hands so you are transferring little or no bacteria.

Frozen fish is much less troublesome to handle and store. A solidly frozen piece is not likely to defrost much between the grocery store and home, even on a hot day. Here your concern is to plan ahead so you can defrost the fish slowly in the refrigerator before cooking it rather than on the kitchen counter, under running water or in the microwave. If you raise the

temperature too quickly, you lose too much internal moisture and the result is a drier piece of seafood on your plate, no matter how carefully you cook it.

You can freeze fresh or leftover cooked extra seafood, though you cannot duplicate the speed of commercial freezing so essential for good flavor and moist meat. The trick is too freeze it as quickly as you can to minimize damage to the cells that hold moisture within the meat. The worst way to freeze is to wrap up a large piece of fish and place it in the freezer. It may take half a day or more before the center part is frozen, that is much too slow. Slow freezing causes large ice crystals to form inside the meat, the crystals pierce the cells, and when you defrost it, the cells leak their liquid.

Here are some suggestions:

- ♦ If you want to keep a large fish whole, place it unwrapped on a metal baking sheet and put it in the freezer. It freezes faster without the wrapping. Wrap it after it freezes solid.
- ♦ A still better way is to cut the fish up into steaks, fillets or chunks and place the pieces side by side on a metal baking sheet so they freeze rapidly, then wrap.
- ♦ Set your timer so you'll remember to check the progress periodically. When wrapping, attempt to eliminate as much air as possible, label it and put it back into the freezer.

Ice glazing is an excellent method that eliminates damaging air pockets (inevitable in any packaging) and keeps the seafood from drying out in storage. To ice glaze, prepare a pan of ice water. Freeze the seafood the way I suggested and as soon as it is solid, dip it into the ice water for a few second until a layer of ice coats each piece. Put the pieces back in the freezer for 15 minutes then repeat ice glazing. Then wrap, label and store it in the freezer. If you defrost this slowly, it will be almost like fresh.

You cannot successfully freeze all fresh seafood. As a rule, the fattier the meat, the less amenable it is to freezing. Your chances are better with lean species. Nearly all shellfish freeze well, too. Lobster, crab and crayfish meat must be blanched before freezing to preserve their texture and flavor.

The longer you keep seafood in the freezer, the more flavor you lose. Provided it is well-wrapped, and your home freezer's temperature is 0°F (-18°C) (typical for a good home freezer), you can keep frozen seafood up to a year. But if your freezer is just ten degrees warmer, 10°F (-12°C) don't keep seafood frozen for more than two months. If you happen to live on the north slope of the Arctic at an average temperature of -40°F (-40°C) you can store seafood indefinitely. Check your freezer's temperature with an accurate thermometer and date every package you put into it.

How to Turn out the Best Seafood in Town

Fish and shellfish are suitable for every cooking method known to mankind, and it is one of the only meats left that is still reasonably safe to serve raw, as in Japanese sushi and sashimi or oysters and clams on the half shell. Some people even eat abalone raw. Of course, you cannot successfully prepare every type of fish with every cooking method. For the best results, you need to match the two. Fatty fish is great for smoking and for any dry-heat cooking method, particularly those that need little or no oil. Lean fish is better cooked moist, but sautéing lean fish in oil or butter is a good choice, too.

While one of the easiest and quickest meals to prepare, seafood is the least forgiving. Most fish and shellfish toughen when you overcook it, the meat fibers contract and lose their moisture. But with continued cooking, the tightened fibers relax and reabsorb flavorful moisture

from the cooking liquid. The seafood becomes soft and tender again. To save a fish or shellfish that you overcooked with any dry cooking method, change the recipe, add liquid, and continue cooking on a low heat it for 20 to 30 minutes. Slow, moist cooking—braising for stews or simmering for soups—is a very good way to cook seafood. But when you sauté, grill, fry, broil, steam, bake or poach, do it for the shortest time.

Why seafood is so quick to cook?

Seafood cooks quickly for two reasons. One is that the proportion of connective tissue, the part that is chewy when not cooked long enough, is relatively small (only 3 percent of seafood is connective tissue, as opposed to 15 percent of land animal meats). The small percentage of connective tissues in seafood is the type that readily and quickly converts into soft gelatin on heating. Another reason is that fish and shellfish muscle fibers are short and fast coagulate into cooked meat. Meats from land animals have long fiber that are slower to soften.

Fish cooks so quickly that even a few extra minutes on the heat causes noticeable drying out. It is very easy to overcook fish. Many cooks are afraid of serving fish half raw, so they err on the overcooked side. To avoid the problem, use an instant-read thermometer. When the internal temperature reaches 140°F (60°C), the fish is done. Let the temperature increase a few more degrees to allow a margin of error for any possible inaccuracy in your thermometer. However, it is difficult to measure temperature of a thin fillet. Insert the tip of the thermometer horizontally into the center.

If you don't have a meat thermometer, here's an old method from the Canadian Fisheries that works quite well. Measure the piece of fish at its thickest part. Cook 10 minutes for every inch of thickness. For a thick 1½-inch (4-cm) steak, for example, the total cooking time is 15 minutes. This works no matter what the cooking method. Experienced fish cooks can judge doneness by gently pressing the meat. It is done when it begins to spring back.

> **TASTINGS Raw fish or pickled fish?**
> Pickled herring and ceviche turn soft, even though uncooked, because the acid in the marinade breaks down the fish muscle fibers. Pickling does the same to raw fish as cooking does.

The cooking methods

Seafood cookery falls into two major groups:

1. Dry cooking:
- grilling (barbecuing or broiling
- sautéing
- deep-frying
- stir-frying
- baking

2. Moist cooking:
- braising
- stewing
- steaming
- poaching (boiling)

I reviewed all methods in detail in the Meat chapter under Cooking methods. Here I will only add cooking suggestions that only apply to seafood.

Dry cooking

Choose a firm-fleshed fish if you have to move the pieces during cooking, whether stir-frying or stirring in a pan or grilling over hot coals. But you can also use dry-heat cooking on a delicate, fragile fish like sole if you first wrap it in a sturdy green leaf, such as cabbage, romaine lettuce or Swiss chard and secure it with a toothpick. A quick 15-second blanching of the greens makes wrapping easier. The fish cooks so quickly that the leaf doesn't even burn. It chars but holds the fish together. Aim for an internal temperature of 140°F (60°C) for the most tender and juicy seafood.

When cooking thin pieces, temperature is not easy to measure with a thermometer and here you need to guess. Here is a guide for grilling or broiling fish over high heat:

- ♦ 1-inch (2½-cm) thick 5 minutes/side
- ♦ 1½-inch (4-cm) thick 7½ minutes/side
- ♦ 2-inch (5-cm) thick 10 minutes/side

When you are dealing with many smaller pieces like scallops or shrimp, put them on skewers to grill or broil. Keep heavy work gloves near the grill to turn skewered seafood.

The U.S. Bureau of Fisheries in 1934 developed a high-heat baking methods that works magnificently on seafood, and with very little effort on your part. Set your oven to the highest possible temperature, 500°F (262°C) or higher. Place breaded seafood on a lightly oiled baking sheet and drizzle it with a small amount of vegetable oil to help browning. Bake it in the oven until golden, about 10 minutes. The result is delicious—tender and juicy inside, caramel-colored and crisp outside.

Moist cooking

Steaming is one cooking method that fails with meat and poultry but works with seafood. It retains all its natural flavor, and you may also add some flavorings. For steaming, the seafood must be very fresh. Steam cooks food at modest speed, slower than dry heat cooking, faster than baking. You can wrap flavoring ingredients with the fish in either plastic wrap or foil. In this case the steam heats the packet but the moisture within the fish is what cooks it. You can steam foil-wrapped seafood in the oven, too (when wrapped this way, the method is no longer baking). The temperature of your seafood doesn't go higher than the boiling temperature of water in any of these methods and you don’t get the benefit of the browning reaction—the flavor will remain subtle.

Poaching in a barely-simmering flavored liquid (like the French *court bouillon*), enough to cover a large piece or a whole fish is an excellent method with flavorful, fatty fish, such as salmon. It is not an easy cooking method, but the result is most spectacular to serve. A whole, freshly poached, tastefully garnished fish is a culinary masterpiece, a stunning visual success, and it tastes delicious. Prepare both the fish and the poaching liquid, then watch the progress with a thermometer to catch the fish before it dries out. You can poach either on top of the stove or in moderately hot oven. A fish poacher is ideal, though not many of us own one, however, you can use any other large, shallow cooking pot or pan big enough to accommodate the fish (for example, a deep roasting pan). Before preparing the poaching liquid, place the fish in the pan and

add plain water to determine the quantity of liquid you'll need to submerge the whole fish. Don't cook the fish past 140°F (60°C), measured in the center of the thickest part. The internal temperature keeps going up for several minutes after you remove the fish from the heat, giving you the margin of safety.

Removing the fish from the hot poaching liquid is not the easiest task. You may use turkey lifting tools or large spatulas or you may wrap the fish in a single layer of cheesecloth before putting it into the liquid, so you can lift it out in one piece. Using heavy rubber gloves is another possibility—it protects your hands from the hot liquid for 15 or 20 seconds, long enough to quickly but gently lift the fish out.

Seafood should never boil, although some cookbooks apply the term boiling for poaching. Even chowders and soups should not boil but gently simmer. The difference in temperature between a full boil and a gentle simmer is about 10 or 15 degrees. In a gentle simmer only a small number of bubbles come to the surface instead of a whole army, as in boiling.

Whole poached salmon

Here's a recipe made with whole salmon that will impress even your most jaded guest. Few fish preparations are as elegant or impressive as a full poached fish with head and tail on, adorned with tasteful garnishing and served cold. On a buffet table a whole fish is always a winner, overshadowing just about anything else. Few nonprofessional cooks are willing to undertake a whole poached fish; its preparation appears overwhelming. But all you need is a little experience and two basic pieces of equipment: a large shallow pot (if you don't own a fish poacher) and an accurate pocket thermometer that guarantees to remove the fish from the heat when it is cooked just to perfection and not a minute sooner or later.

The special poaching liquid lends its flavor to the fish. After cooking you can freeze this liquid (if you have enough freezer space) and use it over and over again. I freeze mine in one or two large, heavy plastic bags. Each time you poach in this liquid, the flavor improves as it borrows a little from every fish you cook in it.

I often use salmon in this recipe, but any fish full-flavored fatty fish lends itself to this technique. I wouldn't recommend one that is downright ugly, like eel or monkfish. Reserve these for a special Halloween feast. The taste is not compromised by their appearance.

If a whole fish is too large or too intimidating for you, choose a large fillet instead. Its presentation is not quite as striking, but the delicious flavor is there, and serving a fillet is far easier than dealing with a whole fish. If you chose a fish that is too large for your poaching container, cut it in half crosswise and poach the two halves separately or side by side (if they fit the pan). Cool, then reassemble the fish on the serving platter after squaring the two cuts with a sharp knife and hide the demarcation line with garnish or a light glazing sauce. No one will know there are two pieces.

For a light buffet or hors d'oeuvres, count on 6 to 8 ounces (170 to 225 g) for a whole dressed fish per serving, 2 to 3 ounces (55 to 85 g) if you poached fillets. Double the amount per serving if it is a main course.

Ingredients

1 whole dressed salmon

court-bouillon poaching liquid (recipe follows)
mousseline sauce—optional (recipe follows)
garnish

Procedure

1. Rinse the fish in running water. If it is too large, cut it in half crosswise as described above. It is helpful to wrap a large fish in a single layer of cheesecloth or a thin kitchen towel to aid in lifting it out of the poaching liquid. To make sure you have enough liquid to cover the fish, place the fish in the cooking pot, cover with water, then measure how much water you used. That determines the amount of poaching liquid you want to prepare. Let the fish warm up 30 minutes before putting it into the boiling liquid so as not to reduce the liquid's temperature too much.

2. Bring the poaching liquid to a boil over high heat and with great care ease the fish into it. Keep the heat high until the liquid comes back to a good simmer, then turn it down to medium or lower until the liquid barely simmers. Cover the pot and start the timer. A large eight to ten-pound fish takes 50 to 60 minutes, a smaller fish anywhere from 20 to 40 minutes to cook. Fillets take 20 to 30 minutes. The only way to tell for certain the fish is done is with a thermometer. Aim for an internal temperature, measured in the center of the thickest part, of 140°F (60°C). Remove the pot from the heat just before the temperature reaches that. It continues climbing for a few more minutes in the hot liquid.

3. Cool the fish covered in the poaching liquid until you can handle it. (If you are short of time, you can take the fish out of the liquid now and air cool it.) Transfer the cooled court-bouillon into a labeled freezing container and freeze for future use.

4. Very gently lift the fish from the liquid. At this stage it is not yet firm and may fall apart if you handle it carelessly. Transfer to a large baking sheet or tray and chill for several hours. If it doesn't fit in your refrigerator, chill it on a thick bed of ice.

5. While the fish is chilling, prepare the optional mousseline sauce.

6. Remove the chilled fish from the refrigerator. Peel the skin off with the help of a fork, starting at the tail end. If the fish has a lot of dark red meat, scrape it off with a small knife or scoop it out, if too deep, and give it to the resident cats. (It has too strong a flavor for most people.) Also scrape away any gray surface substance so only the fine pink coloration of the fish shows.

7. Now is the time to transfer the fish to a serving platter. If you have an attractive platter, use it as is. If you don't, prepare a bed of greens on any large flat container, tray or cutting board covering it completely. Flat leaves of any attractive greens or a bed of parsley are suitable. Gently place the fish on the bed of greens and cover with a thin glaze of mousseline sauce, using a small icing spatula and serve the extra on the side in a bowl.

8. The fish is now ready to be garnished. It is almost mandatory to garnish a whole fish but over-garnishing is a mistake. It takes the focus away from the fish itself. Slices of colorful contrasting vegetables, fruits, sprigs of herbs, hard-cooked egg slices, olives or edible flowers artistically arranged around and on top of the fish are a few of the choices. Slices of lemon or lime are particularly appropriate.

9. Refrigerate the fish if you don't serve it within the next hour or two (depending how warm your storage area is). If your platter is too big for the refrigerator, set it in a large tub or sink on a bed of crushed ice until serving time. Cover the fish and make sure no cats are in the same room. It is amazing what even the gentlest cat will do when confined in close proximity to a source of one of its favorite foods.

Court-Bouillon

Ingredients
6 cups water
1 cup dry white wine (or red wine for strong-flavored fish)
½ cup wine vinegar
1½ tablespoons salt
1 medium onion, stuck with 4 cloves
1 celery rib, cut into large pieces
1 carrot, cut into large pieces
1 teaspoon dried thyme
10 peppercorns
2 bay leaves
6 sprigs parsley

Procedure

1. Combine all ingredients in a non-reactive stock pot. Bring to boil, turn the heat down and gently simmer covered for one hour.
2. Strain and cool if you are not planning to use this right away.

Makes 7 cups of stock, enough for up to a 4-pound fish. Double the recipe for larger fish.

Mousseline Sauce

Ingredients
1½ cups mayonnaise
2 tablespoons fresh dill, chopped
1 tablespoon chives, chopped
½ cup heavy cream

Procedure

1. Blend mayonnaise with dill and chives in a bowl.
2. Whip cream with an electric mixer and gently blend into the flavored mayonnaise with a rubber spatula. Chill until ready for use.

Makes 2½ cups sauce.

Cooking tips

- Flat fish is even lower in connective tissue than round fish, so its flesh tends to be particularly soft. When cooking a flat fish, choose a method that takes little handling and be extra careful to give it minimal cooking.
- Small fish or shellfish, lightly coated with flour, are ideal to sauté until crisp. The bones of some small fish are so soft that, if you brown it to very crisp on the outside, they soften enough to eat. You can avoid the nuisance and mess of picking out the tiny bones at the dinner table.

- Previously frozen fish always tend to be slightly softer and drier than a fresh piece of the same kind of fish. Reduce cooking time to compensate for this. Some cookbooks suggest putting frozen seafood right on the grill or in the sauce pan without defrosting. The idea is to minimize tissue damage that occur during defrosting. When cooking frozen fish or shellfish, double the cooking time, no matter what method you use to cook it.
- Marinating fish, especially those with bland flavor, adds pizzazz and helps soften tough seafood. The acid in the marinade slowly breaks down the fish muscle fibers. If you marinate it too long, the fibers soften too much, and the fish becomes mushy as pickled herring. Because it is made up of short fibers, seafood responds to marinating faster than other meats. A few hours is all you need, but if time is a problem, even one hour in a highly flavored marinade gives extra zip to almost any fish. Marinating seafood is for dry cooking methods.
- Marinating is safest in the refrigerator even though few bacteria are able to grow in the acid environment of the marinade. However, half hour to an hour before cooking time (depending on your kitchen's temperature and the size of the fish), remove the marinating seafood from the refrigerator and let it warm up some.
- Many cooked fish and shellfish preparations are very good cold, too, so extra is a welcome sight in the refrigerator. Plan to make extra if you can use it in the next few days. Remember to chill what's left over soon after cooking and wrap it up. It will be a nice surprise when you are looking for something for lunch. Coming across such a dish after several weeks, however, doesn't please either your eyes or your nose.

Points to Remember

- Buy seafood only if it looks very fresh and use it soon. Seafood is the most perishable of all foods we eat.
- Never let the temperature of seafood go much above that of your refrigerator except shortly before cooking. It spoils much more quickly at close to room temperature.
- If you cannot find good fresh seafood, choose flash or blast-frozen, or individually quick frozen (IQF). If that fails, choose fresh-frozen.
- Take a copy of the fish and shellfish tables with you, included in this chapter, whenever you shop for seafood.
- If you are using a dry heat cooking method, don't overcook. Use a thermometer and don't let the internal temperature of the fish go much above 140°F (60°C).
- Consider marinating seafood before preparing it in any dry heat cooking method.

Lean Fish

Name	Family/Other Names	Description/Comments
Cape capensis	Newly contrived marketing name for whiting.	Comes from South Africa.
Cod, Atlantic		Most widely used and popular fish in this classification. Very good white meat, firm but flakes readily. Flavor mild enough to be acceptable to those who don't care for real fish flavor.
Cod, Pacific	Closely related to Atlantic cod.	Reasonably plentiful, although sources are declining. Softer meat and an even milder flavor than Atlantic cod.
Dolphin	Also dolphinfish. Both are common names for mahi-mahi.	
Drum	A general family name for a number of fish species. The most common are sea bass, white sea bass and red drum (also called red fish).	Good white, firm and moist flesh, which breaks down into coarse flakes. Red drum is popular in chowders and similar preparations. White sea bass is good cooked any way.
Finnan Haddie	Marketing name for hot-smoked haddock.	
Flounder	A flat fish.	Closely related to sole.
Grouper	Another name for sea bass.	
Haddock	A member of the cod family.	
Hake	Another name for whiting.	
Halibut	A member of the flounder family.	This is an excellent fish with a slightly sweet mild flavor and dense, firm, white, tender flesh.
Lingcod	A member of the greening family. Not a true cod.	Popular because the supply is reasonably large, which makes the price reasonable, too. White, tender, dense meat and a rather bland flavor. Blue-green when raw, it turns white on cooking.
Mahi-mahi	Also called dolphin, dolphinfish, and dorado. Not related to the mammal dolphin.	Another trendy fish, with white, firm, dense, coarse-flaked meat and a delicately sweet flavor. Its popularity is partly due to the muscle staying solid in most cooking methods.
Monkfish	A flat fish.	Only the thickened, meaty tail section has edible meat, which is cut into fillets. Firm white meat and good flavor that is mild and sweet, resembling lobster.
Perch	Not related to fresh-water perch, which is rare. Often referred to as ocean perch. Also called rock cod or red snapper.	Moderately firm white meat and a good flavor.
Pike		Excellent flavor and much underrated in America although popular in Europe. It has sweet, firm, white meat.
Plaice	A European flounder.	
Pollock	A member of the cod family.	
Porgy	Also know as sea bream.	Small with a sweetly delicate flavor and firm, coarse-grained muscles. It keeps fresh longer than most other fish but loses its fine flavor if kept too long. Not often available.
Ray	Fishmongers often call this skate.	

Name	Family/Other Names	Description/Comments
Redfish	More commonly known as red drum.	
Rock cod	Often labeled rockfish or red snapper. Not a member of the cod or snapper family. These labels were used in the distant past to encourage consumer acceptance.	Although not as tasty as red snapper, it is a good, firm-fleshed fish resembling ocean perch and sea bass.
Rockfish	The correct biological name for rock cod.	Fish packers use rock cod in marketing to take advantage of consumer recognition of cod as a good eating fish.
Sand dab	A marketing name for flounder. Also called American plaice and is closely related to the plaice found in European waters.	
Sea bass	Also called white sea bass. The only commonly available species of the sea bass family. Sometimes mislabeled grouper, another family member. Not related to bass or striped bass.	Large fish with ribs all along the backbone. Yields perfectly boneless fillets that even a beginner can cut out. White, firm, moderately flavorful meat.
Sea bream	A confusing collective term, most often used for porgy. Also used for a fresh-water sport fish and, in Europe, a type of carp.	
Skate	Also called ray. These are two closely related species of flat fish not distinguished in the market place.	The large wing-like structures on the sides of the body have firm, sweet, pinkish-white meat that is boneless. It turns white when cooked and resembles scallops in texture and flavor.
Snapper, Pacific	A marketing name for rock cod or rockfish. Most commonly called rock cod.	
Snapper, Red	Also called snapper, which is the family it belongs to. Not the same as Pacific snapper, although Pacific snapper is sometimes mislabeled red snapper, a costlier and better-flavored fish.	Very popular with both professional and home cooks because of its delicious flavor and firm, white, large-flaked meat. If the fish you cooked tastes flavorful, you probably got a real red snapper.
Sole	Closely related to flounder.	Fine, firm, white meat with delicate, subtle flavor and a high price, based more on limited supply than superior quality.
Tilapia		Fairly new, introduced into the America. from Africa for algae control in fresh water. Now farmed extensively and available year round. It has a delicate, fine flesh resembling fresh-water perch or bass. Fine flavor, reasonable price and available.
Tilefish	Also know as ocean whitefish.	Firm, tender, mild, white flesh with a flavor that resembles scallops or lobster. Its diet consists mainly of these crustaceans and crabs.
Tuna	Also called albacore, yellowfin and skipjack. Another common name is bluefin, but this fish belongs in the medium-fat group. In Hawaii yellowfin is commonly called ahi.	When used fresh or fresh frozen, remove any dark portions unless you like very strong-flavored fish. Excellent eating and suitable for any cooking technique. Also widely used for canning. Its reasonably good quality and low cost put it among the most widely consumed fish in the U.S. Classified as either white meat or pink meat in the canned meat aisle of any supermarket. Also a common base for canned cat and dog food.
Turbot	A member of the flounder family.	

Name	Family/Other Names	Description/Comments
White sea bass	Another name for drum.	
Whiting	A member of the cod family.	

Medium Fat Fish

Name	Family/Other Names	Description/Comments
Bluefish	Also called snapper and blue snapper.	A common Atlantic ocean fish, with very good flavor and a mild, bluish-red color that lightens when cooked. Soft flesh that flakes coarsely. Flavor varies depending on diet. Since it is a fast-swimming fish, it has a proportionally large amount of red muscle that may be too strong-flavored for some. It is easily removed.
Buffalo	Sometimes marketed as buffalofish. A member of the freshwater sucker family.	Firm white flesh with a mild, sweet flavor. Flavor and character similar to carp. The two can be used interchangeably in any recipe.
Carp		A firm, white, fairly mild flesh, with a very strongly flavored and tough red muscle that can be removed. Quality of the meat caught in the wild depends on the season, kind of water it lived in and diet available.
Catfish		Excellent flavor, rather delicate, with firm, white, moist, flaky meat. The tough skin is thick and must be removed before serving.
Chum	A species of salmon.	Has the lowest fat content of any salmon, and often has the lowest price, too. Coarse, light pink to gray flesh that flakes coarse. Excellent for smoking.
Cisco	A fresh-water whitefish.	
Coho	Also know as silver salmon.	The second most-favored salmon for flavor. The flesh is fine-textured and light to dark pink in color.
Dogfish shark	Member of the shark family.	The best meat for British fish and chips.
Mako	Another name for blue shark.	
Orange roughy		A New Zealand deep-water fish that has become popular in the U.S. since 1979. It has a mild, almost bland, unobtrusive flavor. The meat is similar to cod, white, firm flesh that holds together well in most preparation techniques. Usually available in frozen fillets but also flown in fresh from New Zealand.
Rainbow trout	Member of the trout family.	Most commonly farm-raised. Don't smother its delicate flavor in a complicated recipe. Pan frying allows complete enjoyment.
Salmon	Six kinds of salmon.. Chum, coho, pink and Atlantic are all in the medium-fat group. King (chinook) and sockeye are in the high-fat table.	Rated most popular in U.S. because of its excellent flavor and ready availability at a reasonable price (fish farmed extensively). Firm-fleshed and suitable for any type of preparation. The fat content varies considerably with its spawning season. Fish farming controls this somewhat.
Salmon, Atlantic	The only native salmon to Atlantic waters.	A mild, delicate flavor, pink flesh and large flakes.
Salmon, Pink		Fine-textured, soft-fleshed fish with a delicate but distinctive flavor and a reasonable price. Light peach to pink color. About 50% of canned salmon comes from pink salmon.

Name	Family/Other Names	Description/Comments
Shark	Close relative to skate.	If you buy shark steak and find bones, you got gypped. If it smells like ammonia, soak it in brine or acidified water. Excellent for all kinds of cooking techniques, with very firm, white meat that holds together well and with a moderate flavor. May be substituted for the more expensive swordfish in any recipe.
Shark, Blue	Member of the shark family. Also called mako.	Extra firm, snow-white meat.
Shark, Dogfish	Member of the shark family.	The best meat for British fish and chips.
Shark, Soupfin	Member of the shark family.	Used for oriental sharkfin soup. The cartilage of the fins gives flavor and thickening, but the rest of the fish is also used.
Shark, Thresher	Member of the shark family.	The best and most widely available member of this family.
Striped mullet	Member of the mullet family. Various marketing names have been used to attempt to popularize this fish, but so far all have failed.	Very good, nutty-flavored, white, firm-fleshed fish in abundant supply and reasonably priced.
Striped bass		Firm-fleshed, white, moderately sweet meat with excellent flavor. Caught in the wild, the flavor of striped bass depends on where it came from, as it has much tolerance for polluted water. It doesn't die, just takes on a foul taste. Now raised by aquaculture, which guarantees good flavor. Can be used in sashimi when absolutely fresh.
Sucker	Member of the freshwater fish family. Buffalo is the only species commercially available.	Occurs naturally in great abundance.
Swordfish		Unusually flavorful, with a meaty texture and note that satisfies even non-fish eaters. Extraordinarily firm flesh, light pink to ivory in color, that holds together well in any kitchen preparation, even when abused by the cook.
Trout	Close relative to the salmon.	A fresh-water fish with a wonderful, delicate flavor when absolutely fresh. Different species have differing flavors and textures. When caught in the wild, the flesh varies in color from white to bright pink. Simple preparation is best to preserve the delicate flavor. Also excellent smoked. When farm raised, the price is quite reasonable.
Tuna, Bluefin	Only member of the tuna family in the medium-fat group. The rest are lean.	
Whitefish	Member of the same family as salmon and trout.	Fine, delicate flavor, snow-white, sweet flesh that breaks into large flakes. A good fish to use if you can find it, but not commonly fished commercially.

Fatty Fish

Name	Family/Other Names	Description/Comments
Angelfish	Another name for butterfish.	
Black cod	Not in cod family. Also called sablefish and butterfish.	Cannot be substituted for cod because of difference in fat content. White meat, a pleasant but fairly strong flavor that may not appeal to everyone, and fine texture. Excellent for smoking. This fish is fast becoming one of the trendy dinner fish.
Butterfish	A marketing name for black cod (although a much smaller fish also called butterfish is sometimes available fresh along the Atlantic Coast. A related European version is called pomfret, sometimes called for in French recipes). Also called angelfish.	Excellent flavor, but mainly dark meat.
Conger eel	Not a true eel.	Similar in appearance to eel, but meat is inferior.
Eel		A perfect example of how people in America turn away from an excellent-flavored but disgusting-looking creature. Long, almost snake-like, with slimy/slippery black skin. Very popular in Europe. A traditional Christmas food in some ethnic circles. Can be found in ethnic food markets during the holiday season in U.S. Firm, white meat and very good flavor. Also aquacultured.
Herring		Small, soft-fleshed, highly flavored fish ideal for smoking and pickling. When tiny, it is packed in oil and canned. Small fresh herring, nine to eleven inches, are available occasionally, but it must be absolutely fresh. The flavor deteriorates rapidly because of the fat content. Often flash frozen to maintain the flavor.
King salmon	See under Salmon.	
Mackerel		Some have a strong, rather assertive flavor that scares a meat-eater who's only experimenting with fish. It has a proportionally large amount of red muscle meat, which gives it the strong flavor. Remove the red muscle portion and eat only the milder white muscle meat. Some kinds of southern mackerel have a mild excellent flavor and white, small-flaked flesh.
Pacific pompano	A marketing name for Pacific butterfish. Not related to the sport fish in Florida.	
Pomfret	French name for small European butterfish.	
Pompano	The only important species in the entire jack family.	Found along the southeast coast of the U.S., this is an excellent fish with firm, white, delicate meat. Small (one to two pounds or half to one kg). Considered one of the best fish there is, it is high-priced and, like well-aged prime beef, not often available in retail markets. Exclusive white tablecloth restaurants, clubs reserve the best of the catch. If you see the name pompano next to a large fish in the display case, it is probably a closely-related fish called permit with coarse, dry flesh.

Name	Family/Other Names	Description/Comments
		Good flavor, but not in the pompano class.
Sablefish	Marketing name for black cod and butterfish.	
Salmon	See sockeye. See also coho, chum and various salmon in the medium-fat table.	
Salmon, King	Also called chinook.	Considered by most the best-flavored of all the salmon. Soft, coarse-flaked meat that varies in color from pink to deep salmon to nearly white. Farmed extensively so it is available year-round. Available fresh, frozen and canned.
Salmon, Red	Another name for sockeye salmon.	
Sardine	Member of the herring family.	Most familiar when seen in a can, packed like commuters on a New York subway. Fresh-caught true sardines not often available.
Smelt		A tiny fish with excellent, mild flavor and soft bones, so it may be sautéed and eaten whole. It takes 10 to 12 of these to make up a pound (22-26 a kg). Deteriorates fast, so it is frozen quickly as soon as brought on board the fishing vessel.
Sockeye salmon	Also called red salmon.	More delicate in flavor with firm flesh that breaks into small flakes with a deep orange to red color.
Steelhead	A species of trout	This fish is caught as it migrates back to its spawning area in fresh water. Otherwise it lives in the ocean.

Shellfish

Name	Family/Other Names	Description/Comments
Abalone	Mollusk with a tough rubbery muscle that is usually cut into slices, abalone steaks.	Needs pounding to break down the muscle fibers.
Calamari	Marketing name for squid.	
Clam	Bivalve mollusk, both soft-shell and hard-shell. Sold by size rather than species name.	Purchase live if possible (tightly closed shell indicates it is alive). Littlenecks—8-14/lb (18-37/kg). Topnecks—5-7/lb (11-15/kg). Cherrystones—3-5/lb (7-11/kg). Chowders—2-3/lb (4-7/kg).
Cockle	Species of clam. Incorrectly called winkle.	Much more available in Europe and Southeast Asia.
Conch	Single-valved mollusk mostly found along south Florida shores and in Caribbean.	Large muscle of the foot is edible. Tenderize like abalone.
Crab	Eight varieties common in North America.	Depending on species, claw meat, leg meat or body meat is used.
Crayfish, crawfish, crawdad	Crayfish is small freshwater species that looks like miniature lobster. Crawfish is large marine species that looks and tastes like lobster, but not related. Crawdad is term used in southeast.	Flavor similar to lobster.
Langostino	Small member of lobster family from Chilean coast.	Tail meat looks like shrimp and tastes like lobster but more delicate.
Lobster	Two varieties - European and American (or Maine), which is much larger.	Every part of the lobster can be used. Considered rich food but it is what you put it with that is rich, not the lobster itself. Four grades based on size - chicken, quarters, large and jumbo.
Mussel	Bivalve. Best bought live like clams.	Color varies from pale tan to deep orange with a tangy or smoky flavor. Clams or oysters can be substituted in any recipe.
Octopus		A tough muscle that often needs tenderizing. Very delicate, firm, sweet white meat used in Japan as sushi.
Oyster	Bivalve sold by size.	Highly prized raw. Only good flavor during months that contain an "r." Available small, medium and large.
Prawn	Another name for shrimp. In Asia only large shrimp are called prawns.	
Scallop		Sweet, nutty, firm, delicate ivory-colored meat. Must be cooked very quickly over high heat.
Shrimp	A dozen different species grow in different parts of the world.	Firm meat with delicate, distinctive flavor that even non-fish eaters like.
Squid	Also called calamari. Meat is similar to octopus, but from different families.	Delicate but firm white meat.

Mushrooms always grow in damp places
and so they look like umbrellas
From Russel Harper's collection
of school test paper gems

FOUNDATION VEGETABLES

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Slice of okra with chive
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Even the most primitive cuisines have foundation ingredients—basic food elements that build many of the dishes.

I explore three fundamental ingredients in this section, three quintessential ingredients we cannot be without for most savory dishes—the onion-garlic family, tomatoes and peppers. I threw in mushrooms, too, since they are so unique and complex, and have so much impact on flavor, too. And following mushrooms, why not consider vegetables in general? Specifically, how we can make the best of them in the kitchen.

The fact that, in North America, every reasonably stocked food market and greengrocer carry these fundamental vegetables and mushroom reflects their importance. Obviously, they are in demand.

I'm putting these four building block vegetables in a category of their own, even though the mushroom is technically a fungus, tomatoes and peppers are both (botanically speaking) fruits, and we use members of the onion family (the only true vegetable) mostly as flavoring. Whatever you want to classify them, we would be hard put to do without them in the kitchen.

THE ONION TRIBE

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Sweet onion
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Salt is our number one flavor enhancer—without it we could not prepare a truly flavorful dish. Number two has to be the various members of the onion tribe. Onion and garlic both contribute a commanding flavor to foods. They are used in every cuisine in the world, at least to some extent, and in most of them not just casually. People whose tradition favors bland foods—the British and Scandinavians—use them sparingly, while highly-flavored cuisines—Latin America, the Mediterranean, Central Europe and Asia—rely much more heavily on them. In North America, with our predominantly British and Northern European food heritage, we also used to cook with onion and garlic rather sparingly until the food revolution of the 1970s. Before that shift many people even refused any dish that contained onion, and the even stronger flavor of garlic was considered close to poisonous.

Actually, this belief is not without basis. If you grew up in a family where the cook had little use for onion and garlic, your stomach never adapted to digesting their rather powerful ingredients, and you can readily develop a stomach ache when eating onion and garlic-rich dishes. It is like eating hot chilies. If you are used to them, you eat them regularly in an astonishing quantity without ill-effect. If you are not used to them, your stomach rebels even after half a hot chili, that is, if you can actually swallow any of it.

The Basics

All members of the onion tribe belong to the lily family, *Allium*. This huge family includes such seeming strangers as the lily and asparagus and the family is distantly related to grasses, at least to a botanist.

Introducing the tribe

The native **onion** plant (*Allium cepa*) has been traced back to the Iranian and Pakistani regions of Asia. Over 500 different varieties of onion now grow in virtually every country in the world, except in extreme cold climates.

Some 5000 years ago, Egyptians considered onion to possess a divine power. About 2000 years ago the ancient Greeks and Romans regularly used onion for cooking. This vegetable was the most important flavoring agent in an otherwise very bland European diet in the Middle Ages. Today onion and garlic still have divine power but their almighty, powerful effect is on our taste buds and in our dishes.

Garlic (*Allium sativum*) also originated in Asia, probably from the southeastern part of the Mediterranean. The Egyptians used it just as extensively as they did onion. They attributed power to anyone who ate garlic. Roman soldiers, laborers and gladiators ate garlic before combat and work to build up power and strength. The slaves who built the pyramids lived on onion and garlic.

Garlic differs from onion not only in flavor but the way it grows. Onion forms a single bulb underground that shoots up a stalk which bears the seed from which the next generation of onions grows. Garlic also grows underground bulbs, but they divide into many small bulbs, or cloves, from which the new garlic plants grow. It also shoots up a seed stalk on top of which tiny bulbs form, these bulbs also sprout and grow into new plants.

Some onion varieties also multiply by division of bulbs on top of the seed stalk, as garlic does. They are edible and are called tree onions, topping onions, multiplier onions or brown shallots, but they are not available commercially for kitchen use.

We also use three other members of this family in the kitchen—leeks, chives and shallots.

None of these we use extensively in North America, but they are very popular in French cuisine. Scallions, also called green onions and spring onions, are also part of this group, but they are not a different variety. A scallion is an immature onion harvested before the bulb develops.

Leeks (*Allium porrum*) are a mild, bulbless variety of onion. Originally they may have had enlarged bulbs, but cooks favored the bulbless variety, and they are the ones that farmers propagated. In cooking we use both the leaves and stems. Leeks are particularly popular in the Mediterranean region. They owe their popularity in England to the cool, moist British climate which leeks love, but also because leeks are mild enough for the less adventuresome British palate. They grow so abundantly that in Wales they are the designated national plant. When a recipe calls for leeks and you cannot find fresh ones, substitute scallions and slightly reduce the amount.

Chives (*Allium schoenoprasum*) are even milder than leeks. Their use is more for garnish than flavor. Their grass-like stems, when cut into tiny cylinder-shaped disks, look good on anything—soups, salads, stews, appetizers. Chives are miniature onions, but the bulbs are too tiny to be practical in the kitchen. They have such a mild flavor that you can consider their effect neutral in an overpowering full-flavored dish, but they grant just a hint of onion in bland dishes.

Shallots (*Allium ascalonicum*) are the third mild-flavored member that we use in moderation in our cooking. The flavor of a shallot is somewhere between onion and garlic, but closer to the garlic end and more delicate than either of them. They are the easiest of the onion-garlic bunch to digest, so if someone has problems with onion or garlic, shallots may be the answer. Botanically, the shallot is related to the onion, though it grows in bulbs like garlic. Cooks don't use it much outside northern French, New Orleans and some French-influenced Asian countries. If you need to substitute it, which may be often because fresh shallots are not available everywhere, using the same or a lesser amount of onion and garlic mixture gives a good approximation of the flavor of shallots.

Boiling onion, also called pickling onion, is a walnut-sized immature onion, and is not a different variety. This is the name for onions, usually white, that farmers plant so close together that the bulbs remain small. The name only indicates size.

Pearl onion (*Allium ampeloprasum*) is a separate variety. It is a small single bulb that does not have concentric rings wrapped in paperlike scale like other onions. Produce department sometimes mistakenly market boiling onion as pearl onion.

In the Kitchen

Cookbooks often list onion and garlic as herbs. Both are obviously vegetables, though the manner in which we use them in the kitchen parallels herbs and spices—they are basic food flavorers. You may use both like side-dish vegetables—baked, roasted, cooked, in case of onion sautéed, or as the base for soups—but these are not their prime uses.

All member of the *allium* family are rich in sulfur-containing compounds which they don't release until you cut into their cell walls. Take a whole, intact onion. There is nothing that irritates your eyes and nose. You cannot even smell a whole onion or garlic. But cut into either of them, and their effect is as instant as thickening with cornstarch.

Each member of the family has over 80 chemical compounds, most of which contribute to the highly complex flavor. Two of these (*alliinase* and *sulfur)* form a gas that dissolves in the moisture of your eyes, giving rise to highly irritating sulfuric acid. Other members of the onion tribe release similar but not as powerful irritants. Nature did not put all that aggravation into these plants to annoy cooks—they were meant to give protection from pests and grazing animals. Only once do

they chomp an onion bulb or garlic and they leave them to be ever after.

When you heat onion or garlic, a whole lot of chemical changes result in a number of new compounds that replace previous compounds. Flavor, texture, consistency, color change. Fortunately for us, the irritating substances quickly disappear and change into other chemicals .

Any cooked dish that contains onion and garlic becomes sweet—remember onion and garlic soup? Raw onion contains 3 to 5 percent sugar but boiled onion only about half of that. The cooking liquid absorbs the rest and that's why onion soup tastes so sweet. In sautéed onion, while a lot of moisture evaporates, the sugar becomes concentrated to about 10 percent in the pan. Caramelization of sugar turns the onion brown. (The increasingly sweet taste while cooking onion is also due to a newly created sugar, fructose.)

We use two types of onions in the kitchen: dry and fresh. These are commercial terms, and the two types are hard to identify in the supermarket. Yet, the distinction is important. Dry onions, also called storage onions, are summer crops, harvested in the fall, and these are the common yellow onions we use in cooking. They have a long shelflife and can stay in your cool, dry pantry for months. Dry onions are usually smaller and have a thicker, heavier outer skin than fresh onions do.

Fresh onions are a different variety, are winter crops and farmers harvest them between May and August. Their shelflife, like fresh vegetables, is only a matter of weeks. We know fresh onions as sweet onions, a relatively new marketing term referring to their less pungency compared to dried. (Another marketing term introduced recently as a result of an aggressive marketing strategy is "designer" onions.)

Some sweet onions are, indeed, quite sweet and have very little pungency. Their sugar content must be at least 6 percent to deserve the name "sweet onion", compared to 3 to 5 percent in regular onion. Some exceptional sweet onions have as much as 15 percent sugar—almost as sweet as an apple! They owe their mild disposition and low pungency to their low pyruvic acid content, the chemical that causes their bite. Growing onions on low-sulfur soils results in their low pungency. You can almost eat them like apples, though I wouldn't suggest to include them in your fruit bowl.

We use sweet onions mainly raw in salads, while dry onions are the true cooking onion.

TASTINGS Sweet onion in the U.S.

We have seven sweet-onion growing areas in the U.S. and distributors often sell sweet onions by name, not as simple generic fresh onions. These are the Vidalia from Georgia, Texas Spring Sweet from Texas, Carzalia Sweet from New Mexico, California Sweet Imperials and Fresno Sweet from California, Walla Walla from Washington and Maui from Hawaii. As long as they are fresh, they all are very good, and you can barely tell the difference from one another.

Agronomists developed these fresh onions for three desirable characteristics: low pungency, high sugar and large size. Only seven areas in the U.S. (see Sidebar) satisfy climatic and soil conditions to produce these desirable sweet onions, so the supply is limited and prices are higher than for dry cooking onions. During the off-season, distributors bring in sweet onions from Chile. Cooking with sweet onions is a waste not only because they cost more but because dry onions lend better flavor to cooked dishes.

The organic chemical pyruvic acid that produces pungency also acts as a preservative, which explains why fresh onions having much less pungency spoil so much faster. Keep sweet onions in your refrigerator or in a single layer in a net bag (or stocking), that you hang in a cool

place. Most sweet onions are red, but there are yellow ones, too. Dry onions come in red, yellow and white.

Flavor and pungency vary a great deal depending mainly on where and under what conditions the onions grow and how long they were in storage. Pungency also depends on their shapes. In general, the flatter the onion, the less pungent it is. So look for flat onions for salads, globe-shaped onions for cooking.

Other forms

We can also readily buy both dehydrated and frozen chopped onions. The food industry uses huge quantities, particularly the dehydrated kind, that comes in flakes or in powder form. It is inexpensive, stores well and convenient. Commercial dehydration of onion is a large-scale, efficient and quick process. First they burn off the onion skin. Then they remove the charred skin under a high-pressure water stream, and the onions are ready for the slicing or chopping operation, then under the blasts of hot air the onion is dehydrated.

For onion flavor the food processing industry also uses the concentrated essential oils of both onion and garlic. (See Flavorings chapter for a discussion of essential oils.) Essential oil of onion has 5,000 times more onion flavor than ordinary onion and garlic has about 2,000 times the flavor of fresh garlic. These are such powerful concentrates that they first need to be diluted in a neutral vegetable oil or mixed in some other medium to make them convenient in industrial operations. The food processing industry also uses *oleoresins* of onion and garlic to flavor your processed foods. (see Flavorings chapter for information on oleoresins.)

TASTINGS Onion production
The world's largest producer of onion is China, then comes India and the third is the U.S. Within the U.S., California is the largest producer, Oregon second with less than half of California's production, then Colorado, New York and Idaho.

Because of their high sugar content, onions readily ferment to produce alcohol. This is not a source of alcohol in our culture, but in the Far East onion fermentation is a common practice. When they built the Great Wall of China, the workers had fermented onion as one of their staple foods. It is amazing that none of the American micro-breweries introduced onion beer yet.

Glazed onion Thai style

We rarely use onions as side-dish vegetables. Yet they are easily and commonly available even in the smallest market almost year-round. Many people object to the strong flavor of onion and some have problems digesting it. But when it is well cooked, the strong flavor evaporates with the water vapors, leaving a mild, sweet onion with concentrated caramelized flavor behind that goes well with many entrées except those with the most subtle flavors. It is an ideal accompaniment with robust meats, sausages, well-spiced omelets, roast chickens.

Glazed onions with a touch of sugar for added caramel is old concept but with Thai spices we bring them into the contemporary flavor scene. As with any Mexican and Asian dish, the amount of chili you use determines the pungency. This recipe gives you a medium-hot version. For a milder version discard the ribs (which contain most of the hot chemical *capsaicin*) from the chili,

for a hotter version increase the amount you use.

Ingredients
2 pounds (900 g) yellow onion, peeled, cut in halves, thinly sliced
2 tablespoons sesame oil
1 Thai or ½ serrano chili, sliced thin, including seeds and ribs
1 tablespoon sugar
½ teaspoon curry powder
¼ red bell pepper, cut into julienne strips
1 teaspoon soy sauce

Procedure
1. Sauté onion and chili in sesame oil in a large, heavy sauté pan over medium heat stirring often, until soft and limp, 15 to 20 minutes.
2. Raise the heat to medium-high, add sugar, curry powder and bell pepper, cook with continuous stirring while onion and sugar caramelize to a light brown color, 3 to 5 minutes.
3. Add soy sauce and cook for another minute to evaporate most of the liquid.
Serves 4.

Chopping onion

Next to dish washing, chopping onions has always been the least favorite of kitchen chores. A food processor is a great help for this job, but when you only need a small amount, it is easier to do it by hand. Cookbook authors are generous with numerous suggestions for tearless onion chopping. Some of them are too much trouble, others don't work.. One that does work chills or briefly freezes the onion before chopping. The enzyme action that produces the irritating gas is slow in its action in a cold onion, but you have to plan ahead to place the onion in the freezer. And for how long to freeze is a problem, too. Leave it in too long and you need a chopping axe. Chopping under running water is another method touted by cookbooks. Water dissolves and washes away the irritating chemical. But I could never figure out how to chop under running water. Do you put a chopping board in the sink? Or take the onion into the shower with you?

I've found two good onion-chopping methods, both guaranteed tearless. The first is to take your chopping board, knife and onion outside. Even if there is no breeze, the gases disperse before they can really irritate your eyes. The second method is even better, especially when it is cold outside. Don a pair of well-fitting swim or ski goggles. I always have a pair in the kitchen reserved for onion chopping.

It is a good idea to keep some dehydrated onion flakes on your kitchen shelf for two reasons. You can use them in cooking if you run out of whole onions and they may actually be better than store-bought onions in late winter when the grocery store onion is soft and somewhat passed its maximum storage time. And often its cost rivals papayas from Central America. If you rehydrate onion flakes for 15 to 20 minutes, you can even sauté them. If you are using them in a soup stock, toss them in dry. You need one-quarter of the volume of fresh onion from dehydrated flakes. Onion powder is easy to make from the dry flakes, too, in a mortar. You can readily buy dehydrated onion flakes in health food stores, even in large supermarkets.

Garlic's role

Garlic is not pungent as onion, but it has its own unique collection of concentrated organic flavor chemicals with a mighty flavor impact on food, particularly when raw or barely cooked. Cut into, or crush fresh garlic, and the forceful enzymatic actions start at once. Or moisten dry garlic granules and you wake up the enzyme action just as quickly.

Though prolonged cooking considerably tames garlic, a milder flavor impact remains. The longer the cooking process, the more essential oils (that contain the principal flavor compounds) escape into the kitchen air. If you like a strong garlic flavor, it is best to add the garlic late in the sautéing or cooking process. Many recipes call for sautéing onion and garlic together. For more of a garlic impact, sauté the onion first and only add the garlic during the last few minutes.

As highly-flavored dishes came into demand in American kitchens, garlic became one of our top flavoring ingredients. From an average annual U.S. consumption of 0.4 pounds (180 g) per person in the 1970s, garlic increased to around 2 pounds (1 kg) by the 1990s.

> **TASTINGS Garlic production**
> China leads worldwide garlic production followed by South Korea, India, Spain and the U.S. Almost all our domestically grown garlic comes from California. The Gilroy area south of San Francisco grows 90 percent of U.S. garlic, though that includes some that growers ship in for processing from other nearby areas. Of the more than 200 varieties of garlic, California only grows two—the white, early summer and the pale pink late summer types.

The most common garlic in North American markets is the relatively mild white or silver-skin garlic. The pale pink, also called violet, garlic has a stronger, more pungent flavor, and rose, also called red, garlic is even stronger. The rose garlic is an Asian variety, rare in North American markets. Elephant garlic, so named because of its huge cloves, is a very mild hybrid of garlic and onion, perfect for people who like just a touch of garlic flavor. Elephant garlic is not often in the market.

Garlic, while you mince it, is not nearly as strongly irritating as onion. When you rupture garlic cells with your knife, garlic enzymes set off an entirely different sets of reactions to convert sulfur compounds into three chemical substances—*ammonia, pyruvic acid* and *diallyl disulfide*. Diallyl disulfide is mainly responsible for the characteristic raw garlic flavor, but heat destroys it, that is why cooked garlic has such vastly reduced flavor impact.

What about garlic breath? When you eat raw garlic, diallyl disulfide dissolves in your blood stream that you exhale through your lungs. With a fair amount of garlic in your system, your perspiration also contains some diallyl sulfide. You can smell that in the air around a crowd or on a bus in Asian countries where they cook with plenty. Spritzing breath fresheners in your mouth or chewing on parsley won't help because garlic breath doesn't originate in your mouth. This is equally true for onion breath.

Here are two possible remedies if garlic or onion breath concerns you. You can feed raw garlic or onion to everyone you'll come in contact with so everyone's breath smells the same. Or use a commercially available yeast capsule, a by-produce of wine-making. It interacts with the offending chemicals of both garlic and onion before they get into your bloodstream. This doesn't completely eliminate the odor but cuts it back considerably. These capsules are sometimes sold in gourmet shops. (One such capsule is Monjay made by Bon Mangé, Inc., Davis, CA, 800 553-1224.)

TASTINGS The curative powers of onion and garlic
All kinds of preventives and cures have been attributed to both onion and garlic over the centuries. They are important part of herbal healing practices. Scientists conducted a number of experiments to substantiate these claims, but so far there is no conclusive evidence of which cures what and how. A few experiments that did put forth a conclusion they based on too small a number of people to be statistically significant, or they weren't conducting them according to approved scientific principles. Yet there is little doubt in most people's minds that these herbs do indeed have healing powers. Perhaps the way they work is to eat enough raw onion and garlic so that no one comes close enough to share their germs with you.

Cleaning and mincing garlic

Many cookbooks suggest dropping cloves of garlic into boiling water for half a minute before peeling to soften the papery skin that makes it easier to remove. The method works but it creates another problem. The boiling water mutes the garlic flavor and alters it, even after half a minute. Instead, use another standard method—bang hard on each clove with the flat blade of a large knife. This breaks up the peeling. Some people use a fist-sized smooth stone, copped from a close-by beach, and reserve it just for loosening garlic skins. It is a good idea that works very well, especially when you want to clean several heads of garlic.

When a recipe calls for minced garlic, most cooks reach for the garlic press. But if you've mastered your faithful, well-sharpened French knife, mincing garlic is a cinch without a garlic press. For plenty of garlic to mince, a food processor is an efficient tool. For very finely minced or mashed garlic, a mortar and pestle are the best tools. Add a little salt—its sharp crystals help break down the garlic into a fine purée.

I always chop up several heads of garlic at one time and store most of it in the freezer in tiny, tightly-covered containers. One small containerful stays in the refrigerator for daily use. It keeps well for weeks. When you use garlic often, it is good to have it readily available.

It is also useful to have some dehydrated or powdered garlic on your shelf as a standby. Their flavor doesn't come near to that of fresh garlic, but it is better than no garlic at all if you ran out. Half teaspoon of dehydrated garlic reconstituted with 1 teaspoon water has the flavoring power of 2 cloves of fresh garlic. Let the reconstituted mix sit for 10 minutes before using to develop full strength. Note that if you add this to acidic dishes too soon, acid retards its full flavor development.

Ginger

I am not trying to fool you. Ginger (*Zingiber officinale*) is not even remotely related to the onion tribe, yet to many culinary artists slaving over hot stoves to create edible masterpieces it seems like one of them. We certainly use ginger similarly. And the flavor impact it gives to foods is nothing less than what onion or garlic accomplishes. The combination of complex flavors ginger creates when you use it with members of the onion family is the essence of Oriental cuisine. In fact, only Asian cuisines use ginger regularly, almost religiously, all the way from India, Pakistan and Sri Lanka to the west to China and Japan to the east.

Indians and Chinese knew ginger since very ancient times. It arrived to Germany and France in the 800s and to England 100 years later. Ginger's close relatives, surprisingly, are cardamom and

turmeric. Though we get cardamom from the seed of the plant, turmeric, like ginger, also grows as an underground root part.

Ginger is a rhizome that looks like a thickened misshapen root but in fact is an enlarged underground stem, like a potato, instead of a true root like horseradish or carrot. This rhizome grows horizontally just below the soil surface and can produce new shoots to grow new plants.

Ginger is a tropical plant and mainly China, India and Jamaica grow it. The Hawaiian crop supplies much of the American market.

For those who are interested in hows and whys of ginger, there are three chemical compounds responsible for ginger's overall flavor and pungency: *zingerone, shogaol* and *gingerol*. To compare their pungency to chili (see explanation of Scoville Scale under chili peppers, How hot is your chili?), shogaol rates 15,000 and gingerol 8,000 Scoville units. That is equivalent to a medium hot chili.

Ginger in cooking

In cooking we use three different forms of ginger—green (also called young or baby) ginger, mature ginger, which is the common one and ginger powder. Green ginger is like green onion, that they harvest very young, 5 to 7 months after planting. The young ginger is mild, almost delicate compared to fully mature ginger. Oriental cooks use it in stir-fries, but young ginger is pleasant preserved in brine or syrup. You only find young ginger in Asian markets.

Mature ginger has a full, sharp, biting flavor, and is 8 to 10 months old when harvested. Dried ginger powder, same as our ginger spice, is dehydrated and pulverized mature ginger. Most American home cooks only knew ginger in this form until relatively recently when fresh ginger turned trendy and became available in any half-decent market.

Ginger's rough, uneven surface is a nuisance to peel or scrape clean and it is entirely unnecessary. Just scrub the root thoroughly with water and use as is. To mince ginger with your French knife, chop it first into coarse pieces then continue chopping until fine enough for your purpose. If you are master of your knife, it takes seconds. You may also use a garlic press, but it wastes a lot, and then there is the cleanup. Grating with a small grater works well, too.

TASTINGS Ginger flavoring in industrial kitchens

The food processing industry prefers to use concentrated forms instead of fresh ginger, using ginger oleoresin (see under Flavorings) which is ginger essential oil dissolved in a paraffin-like substance. One hundred pounds (100 kg) of fresh ginger root yields 4 pounds (4 kg) of ginger oleoresin. They prefer this form because it stores well for a very long time, always readily available irrespective of harvest conditions and has a consistent concentration no matter where the ginger came from.

If you use ginger often in your kitchen, as I do, try this method. Chop up about ¼ pound (100 g) at a time in the food processor until very fine, stopping and scraping the bowl two or three times. Freeze extras in several airtight containers, and stash whatever you use in the next couple of weeks in the refrigerator. In this form it keeps fine for weeks if refrigerated, for several months if frozen. This is a very convenient way to have minced ginger on hand at all times, although you lose some flavor with storage. Keep no more than a six-month supply.

Here are two interesting facts about ginger in your kitchen. Cooking ginger in water or oil mutes its pungency. But if you cook it in acidified liquid (lemon juice or vinegar), you noticeably

accent its pungency. Some books recommend soaking ginger in acidified water before adding to the cooking pot for extra pungency, but my experiments in the kitchen didn't verify this. Only cooking in acidified liquid makes a difference.

Storing the Members of the Tribe

Dry storage onion, which is our regular, everyday yellow onion, keeps well for weeks under normal home conditions in a dry, well-ventilated area. Keeping them in a closed plastic bag reduces storage life because moisture builds up in the bag and the onion starts rotting. Same thing happens if your storage area is too humid. If so, your next best bet is storing it in the refrigerator to slow spoilage.

Fresh summer or sweet onion is peris hable and must be refrigerated or at least kept in a cool place of around 55°F (13°C) with fairly high humidity, like most fresh vegetables.

In most kitchens you often need to store part of an onion, and the best place is in the refrigerator. Wrapping it in plastic and foil won't keep the powerful odors sealed in. A good plan is to reserve a wide-mouth jar or other container with a tight-fitting lid just for cut onions and refrigerate it. Some cooks store chopped onion in the freezer, too in a well-sealed container, ready to use when they need it.

Garlic keeps well for many weeks under dry conditions. Its papery skin effectively protects the inside from spoiling or drying out, so don't peel it off until ready to use it.

Fresh ginger is moderately perishable. Under ideal commercial conditions of temperature and humidity, distributors store it up to 6 months. It keeps for a long time in your refrigerator, too, if you store it in your humid vegetable bin but not closed in a plastic bag—remember that the ginger root is alive and needs to breath just like you do. A plastic bag not only restricts air flow but builds up humidity, and in no time your ginger root grows a beard (called mold). It is a good plan to wrap it in paper or kitchen towel to absorb extra moisture.

TOMATO AND ITS BAMBINO, SUN-DRIED TOMATO

The tomato (*Lycopersicon esculentum*) belongs to one of our most important food families, called the nightshade family, along with peppers, potatoes, eggplants and tobacco. It is one of the most popular ingredients in kitchens worldwide. It would be hard to come up with a cuisine that doesn't include tomato, whether it is spicy hot like Thai or as mellow as Dutch cooking. The Chinese was the last one to accept them, and 150 years later tomato is still not a popular ingredients in their dishes.

In the U.S. the tomato is legally a vegetable, even though botanically it is a fruit. It officially became a vegetable in 1892 when the New York Port Authority found themselves short of tax revenues. Authorities didn't tax fruits shipped into New York, but they did vegetables. Calling the tomato a vegetable added a considerable amount to the Port Authority's annual income. The tomato growers were upset, sued New York and the case went to the Supreme Court, which, in 1892, declared the tomato a vegetable since cooks use it and serve it as a vegetable. Today only botanists are authorized to call tomato a fruit.

TASTINGS Fruit or vegetable
The tomato fruit is a vegetable because we use it as a vegetable. There are other

examples of common vegetables that to a botanist are fruits. Cucumbers, peppers, peas, pumpkins and squashes are all fruits. For kitchen purposes we prefer to define any edible produce fruits if they are sweet, and vegetables if they are savory, tart or sour. There are a few vegetables that we use as fruits—just think of rhubarb pie.

The tomato began in the same part of the region of the Peru-Ecuador Andes as chili peppers did. The Andean Indians presumably used wild tomatoes which were yellow. Red tomatoes first appeared in early Mexican cultivation, and these were the seeds that Columbus carried back to Spain in the 1500s. European kitchens didn't use them for some 300 years until the mid-1800s, and North America kitchens (except Mexicans) didn't accept them until the 1900s.

Tomatoes, that originated in the Americas came back to America the long way. The Portuguese introduced them to their African colonies and they found their way back to America with the slaves in the 1700s.

Early tomatoes were rumored to be poisonous, but that couldn't be the only reason people were so reluctant to add them to their diets. Humans tried all kinds of poisonous fruits and vegetables, some got sick or died, but the non-poisonous good-tasting foods were put into use, such as mushrooms. More than likely, those early tomatoes didn't taste good enough to eat. With cultivation and development of tastier breeds, their popularity grew. By the early 1900s they entire world accepted them and cherished them.

Flavor development and nutrients

The tomato's botanical classification as a fruit is meaningless to cooks. We use it as a vegetable, except in rare instances like tomato-strawberry pie or tomato marmalade. But the distinction is significant in another aspect. Although all vegetables are *non-climacteric*, which means that they don't ripen after they are harvested, the tomato, which is a *climacteric* fruit, will continue to ripen if they picked it before fully ripe. (See discussion of fruit ripening in the Dessert chapter)

The term *mature* is a growers' and agronomists' term and is somewhat misleading to consumers. It means that the produce (if it is climacteric) has passed a certain phase of growth and will continue to ripen even if harvested green. That is why they can legally market tomatoes as "vine-ripened" even when picked virtually green with barely a pink spot or two—sometimes so green you may mistake it for Granny Smith apples.

It is the correct balance of sugar and acid that defines a good tomato flavor. In fact, that is all there is to its good flavor. Total solids in a tomato are only 5 to 6 percent, mainly sugars, a small amount of organic acid, some fibers, protein and flavor compounds. The rest is water. The best tasting tomatoes have high sugar and high acid in perfect balance. If the sugar is high but the acid is low, the tomato is sweet and flat-tasting. You can always doctor it up with a small amount of acid (lemon juice or vinegar) in the dish to remedy. More commonly, however, tomatoes are high in acid and low in sugar (because they picked them before full development of the sugar). They taste sour and flavorless. A little sugar may improve the flavor.

A good, fully mature, fresh-picked, truly vine-ripened tomato can be so sweet that it rivals a ripe peach, but unless you have tomato plants in your back yard, fully-ripe tomatoes are not easy to find. They harvest all large-scale commercial tomatoes at the mature green stage, and then artificially ripen them with ethylene gas just before marketing (see discussion of fruits under Desserts). Should they be left on the vine longer, they become too soft to survive modern

harvesting and transportation methods. A bruised tomato not only has a much shorter shelflife but is not acceptable to consumers. Hand-picking ripe tomatoes and packing them individually in cushioned cases is an alternative, but at a price few of us can afford.

Even after they are gas-ripened, the tomatoes must be very firm, therefore not fully ripe, to meet supermarket demands. One grocery store chain's criterion for an acceptable tomato is that they can drop it three times from a six-foot height without bursting. A good supermarket manager plans ahead and let tomatoes ripen for several days before putting them on display. Because of space limitations, that is rarely possible.

Processed tomatoes, on the other hand, stay on the vine to the red ripe stage when their flavor is fullest. Since processing is within hours of harvesting, bruising is of no consequence. If you ever travel in the tomato growing areas of Northern California in late summer, you'll see enormous double-trailer dump trucks by the hundreds filled to the brim with bright red tomatoes headed for Campbell Soup or some other processing plant. If you have the yen to can some yourself, just stop near one of the sharp curves on a country road skirting the tomato fields, or at any interstate on-ramp, and pick up bushelsful of the many that escape from the trucks in transit.

Canned vine-ripened tomatoes do have a good flavor but not the same as fresh, truely vine-ripened tomatoes. Processing at elevated temperatures changes some of the flavor-producing volatile content. There are several hundred known volatiles in tomatoes and still a great number of unknown ones. In spite of the change, good-quality canned tomatoes are excellent for virtually any cooking purpose. Taste-testing panels of food and consumer magazines rate American canned tomatoes high on a number of tests, even ahead of the much higher-priced imported Italian plum tomatoes.

The nutrient contents of canned and frozen vegetables are also higher than most consumers think. Whether for canning or freezing, they harvest vegetables close to fully-ripe stage and process or freeze quickly enough to almost fully preserve nutrients. They are, indeed, richer in their nutrient content than fresh vegetables stored too long in warehouses or someone's refrigerator.

Tomatoes are particularly high in vitamin C. The highest concentration of this vitamin is in that jelly-like substance surrounding the seeds. When a recipe calls for seeded tomatoes, you discard a great deal of the vitamin C along with the seeds. I suggest, for maximum benefit to your health, that you disregard that step in a recipe whenever possible. Removing the seeds is purely cosmetic.

Health authorities consider tomatoes the number one nutrient source of all fruits and vegetables in the U.S. because we eat them in such large amounts. Each of us puts away 80 pounds (36 kg) a year, on the average, in one form or another. That is nearly ¼ pound (115 g) a day!

It is in the genes

Good-tasting tomatoes from the supermarket? Is that a culinary dream or could it be real? And if real, is genetically altered produce the answer? We received the first of such a produce, genetically altered tomato from California, in 1994, with full approval of all government agencies. Naturally, all of us discriminating tasters were excited but most of us skeptical. The skepticism was two-fold. Many didn’t like the concept of genetic meddling, others didn’t believe it could be true. But we were eager and willing to try. Reluctant to purchase flavorless winter tomatoes, we have been restricted to a few summer months for good tasting raw salad tomatoes. Will genetically altered tomatoes allow us a far longer season of enjoyment? First, what does genetic alteration do?

The process of genetically altering tomatoes is not simple, but easy to understand. The geneticists introduce the new genetic message through tissue culture into leaf parts. After the plants

bear fruit, they collect the seeds. Any plant propagated from these seeds will include the new genetic message.

In the case of tomatoes, researchers splice genes into the plant that will slow the action of a fruit-softening enzyme (*polygalacturonase* or PG for short). The genetically altered tomato can remain on the vine much longer without getting soft. Instead of harvesting in the mature green stage, the grower harvests it when red but still firm.

I was among the first to search for the genetically-altered version and compare it to other tomatoes on the local market. This was in the middle of the fresh tomato season in Northern California, so there were plenty of "normal" ones to compare with the genetically-altered "McGregor" tomatoes, as they named the first ones.

The altered tomatoes were large, firm, pinkish-red and attractive, weighing about ½ pound (225 g) each. They were not as red as a fully vine-ripened tomato though, and sold for about two and a half times what other store tomatoes cost. The flavor was pleasant and tomatoey but disappointing. When I compared this tomato to an artificially-ripened supermarket tomato, the new kind had somewhat more flavor, but it could not come near the farmers' market vine-ripened tomatoes. In the middle of winter when you long for fresh tomatoes, genetically altered ones could be your answer.

However, the McGregor tomatoes didn't make it past their second birthday and the company withdrew them from the market claiming problems with their production and distribution. Apparently, they didn't live up to supermarket produce managers' tomato tests expectations—they didn't survive the six-foot-drop tests three times as other tomatoes, and they survived poorly in transportation.

Tomatoes in the Kitchen

Most good cookbooks tell you not to refrigerate your tomatoes. It is true that in cold temperatures tomatoes, like all foods, lose much of their flavor. Wholesale produce distributors and supermarkets never refrigerate tomatoes either. They keep them in a cool room at about 55°F (13°C) once they reach the red but firm stage. And you never see them in the chilled vegetable bins at the produce department. However, lately food scientists disputed the no-refrigeration rule. As a consequence, I tested two identical-looking, fresh, candy-red vine-ripened tomatoes. One shivered a full day in the refrigerator and the second one rested patiantly on the cool kitchen counter. At the end of the experiment I allowed the chilled tomato to come back to room temperature and cut both tomatoes for a taste test. I couldn't detect any difference in flavor or texture. The no-refrigeration rule for tomatoes appears to be an old myth. I urge you to try your own tomato experiment.

TASTINGS Tomato equivalents

- 1 medium tomato is ½ cup and equals 1 tablespoon tomato paste
- To get tomato sauce from paste, dilute 1 part paste with 2 parts water
- Tomato purée is halfway between sauce and paste in concentration
- 2 medium tomatoes is ½ pound (225 g) or 1 cup chopped
- 1 pound (450 g) tomato yields 1½ cups drained pulp
- A large tomato is 7-8 ounces (200-225 g), a medium tomato 4-5 ounces (110-140 g), a small tomato 3 ounces (85 g)

If you buy tomatoes that are still pink rather than red, ripen them in a warm place for a few

days but not in direct sunlight (as some cookbooks suggest). Direct sun cooks or spoils them before they ripen. To speed ripening, put the tomatoes in a paper bag that traps and concentrates the natural ethylene gas from the tomato. The paper bag lets the accumulated moisture escape that hastens spoiling. Banana is a generous ethylene gas generator. If you have one, put in the bag with the tomato.

When cooking tomato-rich dishes, avoid aluminum and cast-iron pots if the cooking process is longer than 20 or 30 minutes. Not only the acid in the tomatoes leach out too much of the metal, giving the dish an off-flavor, but tomatoes discolor by these metal pots, eventually turning dingy brown.

Dried and sun-dried tomatoes

Dried tomatoes, also called sun-dried tomatoes, were possibly the most trendy vegetable on the American markets in the 1980s and they still somehow survived into the 1990s though they lost their tarnish. I also think that they are the most overrated vegetable. Their appeal is their appearance. Dried tomatoes dress up a plate or a dish with their pleasing shape, texture and color. It is the flavor that is somewhat overrated and often does not come up to expectations.

The idea of drying tomatoes to preserve them is not a new one. This alternative to canning is easy, but it requires warm sunny weather during and after the tomato harvesting season. Any rain or periods of cloudy, cool weather, and the sun-dried tomatoes turn mold-covered and semi-dried. This means that climate limits making truly sun-dried tomatoes to very few tomato-growing areas in the world: the Mediterranean regions of Italy and France and California.

Italians have produced sun-dried tomatoes for at least a century. In the early 1980s importers introduced them to North American markets and they were accepted instantly, even though the imported products were quite costly. Sun-dried tomatoes made a hit with the nouvelle cuisine chefs of the West Coast who constantly search out innovative new products.

They were particularly popular in the winter when red-colored produce was rare. (Red peppers were still not common and outrageously expensive back then, because they were air-freighted from Holland.) High price or not, dried tomatoes have a long shelflife and are available when needed. They solve the problem of providing a desirable eye-catching red color on the plate during the colorless winter months. That is why the red pepper has been such a smash hit, too.

Home cooks picked up the idea and sun-dried tomatoes were on their way, helped by a generous dose of intense marketing. It didn't take long before several California dried fruit producers noticed this very profitable opportunity to compete with the pricey Italian imports. Since they had both the know-how and equipment to dry fruits, it was but a short step to add tomatoes to their line of dried produce. Dried tomatoes, they discovered, bring in much more revenue than prunes and apricots.

To dry tomatoes in the traditional Italian way by sun is slow and labor intensive. It takes 8 to 10 days under the weakening late summer sun. Leaving the tomatoes exposed that long to insects is somewhat questionable, too. Italians use their sun-dried tomatoes in pasta sauce, so they are always cooked before eating. Americans, on the other hand, eat their sun-dried tomatoes raw or blanched quickly to reconstitute the moisture content. Drying does not destroy the bacterial contamination so for export, they add sulfur and salt to eliminate bacteria. The California processors also tried heat treatment to solve the problem.

There are three major ways for American processors to dry tomatoes:

1. Like the Italians do, under the sun for 8 to 10 days, then pasteurize to produce a safe and

acceptable product. This process retains the original color and some of the flavor.

2. Dried like other fruits, in hot dehydrating ovens at about 190°F (88°C) with fans to draw the moisture off, a process that takes only a few hours. The process is quick and eliminates the need for sulfur or pasteurization because of the heat that kills microorganisms. But the tomato turns rather dark, losing its attractive color, because the heat partially caramelizes sugar. The heat also alters the flavor a great deal, more than pasteurization does.

3. Dehydrated without heat by blowing fans. In warm weather this process takes about 36 hours and results in a product similar to sun-dried tomatoes with good red color and moderate change in flavor. To kill all larvae, processors freeze the dried tomatoes for two days.

It takes 17 pounds (17 kg) of fresh tomatoes to make 1 pound (1 kg) of dehydrated product after about 95 percent of the moisture evaporates. Processors' favorite is Roma tomatoes, which have less moisture to begin with, but some small specialty producers use other, more flavorful varieties and sell them for premium prices. While firm and low in moisture, commercial Romas are not very flavorful tomatoes even when fully ripe. None of the dehydrated tomatoes have anywhere near the flavor of vine-ripened tomatoes. But they do have their own distinctive flavor and special place in our kitchens.

Dried tomatoes in the kitchen

Dried tomatoes are easy to rehydrate in hot water. The smaller pieces rehydrate in seconds, while halves take about three minutes. To make dried tomatoes even easier to use, food packers now rehydrate them, pack them in olive oil and sell as "marinated" dried tomatoes. (The name is incorrect because true marinating changes flavor and texture.) The oil keeps the tomatoes from spoiling which they are susceptible to after rehydration. These oil-packed tomatoes are ready for use for any purpose, but they cut deeply into your food budget. You can easily do the same thing yourself and at a much lower cost. Just rehydrate dried tomatoes in hot water, drain, pack them in a jar and cover with olive or other vegetable oil. Very simple, very inexpensive.

One problem cooks face with dehydrated tomatoes is chopping. They are tough and a knife doesn't make your job easier. Kitchen shears work a little better, but it is still a slow and tedious job if you want to chop a cup or two. Here is an easier way. Freeze them first, then put them in a plastic bag and hit them with a hammer. This method doesn't produce perfect slivers of tomato, but the small pieces are suitable for most purposes. If you have dried tomato halves and want slivers, the easiest method is to rehydrate the halves in hot water, drain and cut the softened tomatoes into slivers with a knife.

Dried tomatoes have a long shelflife compared to fresh tomatoes. Processors say that after six months they will lose considerable flavor, and the color gradually darkens due to oxidation. They suggest not keeping dried tomatoes beyond a year but that is too conservative. After keeping them for several years to me they seemed perfectly fine both in color and flavor. Putting them under oil keeps them from deteriorating. Some vegetable oils may turn rancid if not refrigerated, but in pure olive oil dried tomatoes should stay fine for several years without losing flavor or changing color.

Specialty food stores sometimes carry such strange items as dried tomato paste in tubes like toothpaste, or in jars labeled tomato tapenade. Both are basically dried tomato purée with added olive oil, garlic and herbs. You are better off making your own from canned tomato paste at a fraction of the cost and with far better flavor.

San Remo tomato-herb salad

Tomato is the star of this summer salad but it is the flavor of the combination of herbs and the dressing that complements and accents it into a pleasing complexity. The cucumber adds little flavor but color and texture as do the black olives. The croutons add both flavor and crunch.

You can prepare this salad in advance, in fact, it benefits if the flavors have a chance to blend well-covered at room temperature for an hour or two. It looks best if you individually pre-plate it shortly before serving so the dressing doesn't wilt the bed of greens.

Ingredients

1½ pounds (680 g) ripe (not soft) tomatoes, chopped into ½-inch (1¼-cm) cubes
1½ pounds (680 g) unpeeled seeded cucumbers, chopped into ½-inch (1¼-cm) cubes
5 ounces (140 g) black ripe olives, rinsed and drained
4 teaspoons capers, rinsed and drained
½ cup fresh chopped basil
¼ cup fresh chopped tarragon
3 tablespoons fresh chopped oregano
¼ cup chopped Italian parsley
1¼ cups garlic croutons
1 head red or green-leaf lettuce

Dressing

3 tablespoons white wine vinegar
1 tablespoon fresh lemon juice
½ cup olive oil
5 tablespoons vegetable oil
1½ teaspoons salt
1½ teaspoons fresh-ground black pepper

Procedure

1. In a large bowl combine tomatoes, cucumber, black olives and capers and gently toss by hand.

2. Combine basil, tarragon, oregano and parsley in a small bowl and sprinkle them over the tomato-cucumber mixture. Toss again to distribute the herbs.

3. Add the vinegar, lemon juice, oils, salt and pepper in a medium bowl and beat for half a minute with a wire whip or fork until beginning to form an emulsion. Pour over the salad and combine. Do not refrigerate if serving within a couple of hours.

4. Prepare a bed of large lettuce leaf pieces on 8 or 10 plates shortly before serving. Stir the salad gently one more time and divide it evenly over the lettuce beds. Sprinkle with the croutons and serve at room temperature for the fullest flavor.

Serves 8 to 10 people.

PEPPERS AND CHILIES

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The hottest food item of the 1990s American culinary scene, no doubt, is the fierce chili pepper, both literally and figuratively. Not far behind is its gentle, friendlier brother, the bell pepper. Chili peppers add a unique flavor essential in many dishes and they are without substitute. There are virtually no cuisines in the world that can survive intact without some form of pepper or chili.

Can you think of another food plant that has produced so much discussion, argument and controversy as chilies? A whole culture of chili eaters and growers, called *chiliheads* or *chili aficionados*, reside in the Southwest and California. Proof of the power of this cult is the magazine called *Chile Pepper* produced in New Mexico. Yet there seems to be no consensus in any area about chilies, not even the seemingly simple rating of their pungency.

Botanists and food scientists at a number of institutes and university research centers in New Mexico, people with the most advanced knowledge on chili peppers, have made collaborative efforts to straighten out the chili chaos, particularly with respect to using one single name for each variety, so far without success.

Chili writers and aficionados don't even agree on how to spell the name of their favorite subject. In some books it is chile, in others chili, and in still others chilli.

TASTINGS Chili or chile?
The Incas called chili peppers *ají*. The Aztecs called them *chili*. The Spanish changed the name to *chile*. Only in Spanish-speaking countries and in parts of the southwestern U.S. are chilies referred to as chiles. To conform to majority, let's spell it **chili**.

The forefathers
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The *Capsicum*, a family name that includes all peppers and chilies, is a New World plant. Distinction between the two is vague and culinary rather than botanical. We call the mild, sweet capsicums peppers, while the hot pungent members chilies.

Capsicum's wild ancestors have been traced back to the eastern slopes of the Andes, in Central Bolivia and the adjacent mountains to the east in Brazil, same region where tomato's wild ancestors lived. By the time Columbus arrived, the chili pepper, or *ají* as the Incas called it, enjoyed wide cultivation throughout Central America and the Caribbean. Columbus called it pepper (*pimiento*) because its pungency resembled that of the black pepper (*pimienta*) he was searching for.

He took seeds back to Spain from Hispaniola (today's Dominican Republic and Haiti) in 1493, and from there they spread throughout the world at an amazing speed. In the 1500s the Turks, who adored chilies, already introduced it to Central Europe, and by the end of the century virtually the entire world was growing capsicum in some form or another. That is an amazingly fast spread compared to the slow acceptance of tomatoes. Mild-food-loving Europe, particularly the western and northern regions, was the slowest to integrate peppers of any sort into their cooking because these pungent plants assaulted their taste buds. (At that time the non-pungent bell pepper have not yet existed.)

Napoleon's blockade of European ports made chilies much more popular because people could not get their hands on other spices. Chilies, aggressive or not, were better than no spices at all. Chilies immigrated to North American surprisingly late and not from their native South America. The African slaves introduced them to the Southeast plantations, along with tomatoes, in the 1700s. Since the climate was favorable for growing chilies, their use spread quickly in that area.

Each region of the Middle East, Far East, Africa and Asia grow unique varieties to satisfy local taste buds. From the original five domesticated species, growers over centuries developed hundreds of new varieties (hybrids called *cultivars*—*culti*vated *var*ieties). For example, a seed catalogue from Florida specializing in chilies lists 137 hot and 59 mild chilies and peppers varieties.

In Mexico alone they grow at least an astonishing 90 more or less distinct varieties of chilies, but in reality many more exist. In each remote mountainous area, villagers grow their own variety that will thrive only under local soil and climatic conditions. Mexicans worship chilies. The highest chili consumption in the world is in Mexico where they eat a staggering tablespoon of chili pepper per person every day. Korea is next with two teaspoons per person.

Growers mainly cultivate two of the five domesticated species of chili peppers. One is *Capsicum annuum,* that includes the familiar bell pepper, as well as *cayenne* and *jalapeño* peppers. *Capsicum frutescens* includes the rest of the enormous variety of chilies. Other cultivated species are only regionally important, mainly in South America.

How to choose them

There are not many varieties of the bell pepper. Your major choice is color. With selective breeding you can now buy red, orange, blond, yellow, purple and almost black bell peppers, along with all the shades in between. This rainbow is a relatively recent development.

Chilies, on the other hand, give cooks enough choices to induce a headache. In most areas there are at least a dozen different kinds available, many more in the Southwestern U.S. Even when there are only a few to choose from, it is not easy to recognize a particular chili for the casual user. If you don't use chilies much in cooking, even the common types can confuse you. If you decide to make a recipe, for example, that calls for two Fresno, two Anaheim and one New Mexico chili (these are among the more common chilies), you may have difficulty finding the right ones. Most

supermarket produce clerks go by the shipper's label, and often even those are incorrect. You have to know what you are looking for. Buying dried chilies is easier because the labels on packages tend to be more often correct.

It doesn't make it any easier that a fresh chili may have a different name than when dried. The color of the chili may change its name, too. In other words, a single chili variety may have four different names, fresh, dried, red and green. But there's more. Many of the same chilies have different names in different regions. An *ancho* chili in New Mexico is called a *pasilla* in California and a *pisado* in Texas. Look at the table below for help in identifying more common chilies.

All chili and bell pepper plants produce green-colored fruits, sometimes yellow. The green pigment c*hlorophyll* provides the green color in a mature pepper while *carotenoid* pigment produces the yellow. All chili and bell peppers continue to ripen as long as the grower leaves them on the plant. While ripening, the green chlorophyll pigments change to yellow carotenoid, eventually turning the color to a bright red. Some peppers retain the chlorophyll while also developing carotenoids pigments, then we have brownish-colored chilies. Some varieties are such gorgeous chocolate-brown that you are real tempted to take a big bite out of them. Resist temptation!

Sugar content increases significantly during ripening. Chilies and peppers have far more flavor in the fully mature stage, like tomatoes. They are actually quite sweet but remember, they are fruits. But in the red-ripe stage they have a short shelflife, just like tomatoes, and grocers don't like to carry them.

Ground chili and chili powder

Ground chili and chili powder—two types of chili-related powders on the spice shelf are confusing but it is important that you keep the distinction in mind. It is the name that causes this confusion. *Chili powder* is a commercial spice mix of ground chili, cumin, oregano, garlic powder, sometimes salt and other ingredients. *Chili* or *ground chili* or *powdered chili*, on the other hand is just pure finely ground chili, like paprika, with no other added spices. They make it from dried ripe red chilies, either from *chile seco, ancho* or a blend of the two.

TASTINGS The birth of chili powder
A Texan named Willie Gebhardt was first to produce commercial chili powder in 1892. He obviously came up with a good blend, since Gebhardt chili powder mix is still on the shelves more than 100 years later. Now it has many other neighbors to choose from, some good, some bad, but none can match what you can make yourself with a good recipe and from fresh-ground (and preferably fresh-roasted) spices.

Paprika is the powdered form of dried red paprika peppers that growers specifically raise for that purpose. (Bell pepper and paprika pepper are very close relatives.) It has a unique flavor thanks to the specific variety of the pepper, the climate and the process of making the powder. The paprika pepper originally was pungent. Processing included removing the inside membranes by hand that contain all of the pungent chemical, then drying and grinding what was left into a fine powder. In 1945 a Hungarian agricultural researcher, Ernö Obermayer, developed a sweet paprika pepper after 25 years of selective breeding in which the veins were not pungent. This allowed machine processing of the ripe peppers because, even if some of the insides end up ground up with the outer shell, it doesn't increase the heat of the powder.

Farmers tried to grow Hungarian paprika plant in a few other parts of the world—Spain, California, the Yakima Valley of Washington and St. James Parish in Louisiana. But thanks to the unique climate, none matches the flavor of the Hungarian-grown powder. In two regions of Hungary (Szeged and Kalocsa) a 5-month growing season with the perfect alternation of warmth, sunshine and rain with a total of 2900°C yield the perfect paprika pepper. Nowhere else has such conditions. When the region has only 2700°C total heat, the paprika crop is mediocre. People talk about paprika in that region, like they talk about wine in the Bordeaux region of France.

Chili Names and Identifying Characteristics

Name	Hotness	Description	Comments
FRESH CHILIES			
Jalapeño	Hot to very hot in Mexico. Mild to medium hot in U.S.	Dark, nearly black-green, thick-fleshed, smooth-skinned, stubby with rounded tip. Sometimes available bright red. 2½-3" long, 1" wide. (6-7 cm, 2½ cm)	Most common chili specified in recipes. Commercial pickled chilies are often made from these.
Serrano	Very hot.	Dark green, smooth-skinned, shiny. Red when ripe. 1½-2" long, ½" wide (4-5 cm, 1½ cm).	Similar to jalapeño but smaller, narrower, more pointed tip and less fleshy.
Fresno (chili caribe or chile cera in Mexican cookbooks)	Mild to hot	Small, triangular-shaped, yellow with smooth waxy surface. 2½" long and 1" wide (6 cm, 2½ cm)	When red ripe, can be mistaken for jalapeño, but Fresno is broader at shoulder.
Poblano (pasilla only in California)	Mildly pungent	Fleshy, shiny triangular-shaped dark green to black-green, turning red or brown when ripe. 3-5" long and 3" wide at stem end (7½-12½ cm, 7½ cm).	Looks like small bell pepper but flesh is thinner. Commonly used for chili relleno. Not used raw.
Anaheim (variety of New Mexico)	Mild or slightly hot	Bright green maturing to red or brownish-red. Long and skinny with thin flesh, almost same width throughout length, blunt or slightly pointed end, no shoulder at stem end. 6" long and 2-2½" wide (15 cm, 5-6 cm) .	Used in chile relleno. Can substitute for New Mexico, Texas or California long green chilies. When dried it is called chili seco or chile colorado. Used in red chili wreaths (ristras).
Habanero	Hottest chili on earth	Yellow-green, when ripe red, these come in beautiful shades of orange, yellow, red or nearly white. Small and flat, bell-shaped, lantern-shaped or almost round, with thin, crinkly skins. 1½-2" long, 1-2" wide (4-5 cm, 2½-5 cm).	Originally cultivated in Cuba (that is how it was named). Popular in Mexico, spreading to U.S. Ones grown on Yucatàn Peninsula are hottest.
Cayenne	Very hot	Usually sold ripe red, sometimes green. Long and slender with wrinkled skin and irregular shape. 2-6" long, ¼-½" wide (5-15 cm, ½-1½ cm).	
Hungarian wax (banana pepper)	Fairly hot to very hot	Pale yellow, waxy, thick-fleshed, conical-shaped, tapering to blunt tip. 3-6" long, 1-2" wide (7½-15 cm, 2½-5 cm).	Non-pungent varieties of this one are also grown.
Cherry	Sweet or slightly hot	Thick-skinned, cherry-shaped, green to red with smooth, shiny skins. <1" long, 1¼-1½" wide (<2.5 cm, 3-4 cm).	Used almost entirely for pickled peppers. Not used fresh and don't dry well. Looks much like cascabel when dry.
Pepperoncini	Almost no pungency	Green or red, elongated curving, cylindrical shape, pointed end, think wrinkled skin. 3-5" long, 3/4" wide at shoulder (7½-12½ cm, 2 cm).	Often used in pickles. Rarely used fresh, never dried.
DRY CHILIES			

Name	Hotness	Description	Comments
Ancho	Mildly pungent	Dark reddish-brown, orange-red or mahogany.	Dried version of poblano. Most widely used dry chili in Mexican cooking.
Chilaca (chilacate)	Mildly pungent	Raisin brown to nearly black.	Same as ancho, picked riper.
Mulato	Pungent	Blackish-brown color (retains this color when rehydrated), chocolate-like. Rich and sweet taste.	Similar to ancho, used interchangeably (ancho a brighter red when rehydrated)
De árbol	Very hot	Vivid brick red, long and slender, curving and pointed. Thin, smooth-skinned with thick flesh. 1-2" long, ½" wide (2½-5 cm, 1 cm).	Similar to dry cayenne
Cascabel	Fairly hot but not fiery	Tiny with tough smooth skin that wrinkles when dried, chocolatey reddish-brown. 1" round (2½ cm).	Looks like cherry chili.
Chile seco (seco del norte, Calif. chile pod)	Mild to slightly hot		Dried form of the Anaheim.
Pasado	Mild to slightly hot		Unique flavor that comes from green roasted Anaheims.
Chipotle	Hot to very hot.	Smoke-dried (too fleshy to dry otherwise) ripe jalapeño.	Not available fresh, sometimes dried, often canned in Hispanic grocery store. One pod flavors a large dish.
Pequín (piquíne)	Fiery hot.	Tiny deep red or orange round, with smooth skin. ½" diameter (1 cm).	Looks like small pie cherry.
Japoné	Pungent	Deep red.	Appears on some labels but uncertain origin. Probably refers to type rather than variety.
Thai	Hot	Small red, resembling serrano but tinier. ½" long (1 cm).	Doesn't refer to a variety. Common in Southeast Asian stores.

It is the fire that counts

The most unique feature of chilies is their pungency, called "heat." The pungency is possibly a natural protection against the wrong animals eating the fruit, animals that won't help spreading the seeds. Birds eat peppers without any ill effect, the seeds pass through their digestive systems whole, and that is how peppers spread in the wild. But that built-in natural protection fails on humans who eat them, no matter how much it hurts.

Pungent chilies are both antibiotic and preservative. They preserve meat by retarding the oxidation of fats (rancid flavor), but they also hide the off taste of not-very-fresh food. Scientists also determined that *capsaicin*, the chemical that causes chili's heat, forces the body to release *serotonin*, a chemical that lowers body temperature by inducing sweating and bringing blood to the face, both for dissipating body heat faster. All of these would explain why chili eaters are mainly in hot climate.

The mystery of why they have become so popular in North America still remains. Psychologists and physiologists have explored reasons why people endure the pain of eating hot chilies, but haven't produced many satisfactory explanations. Some compare eating hot chilies to embarking on perilous adventures without the danger. Others claim the secretion of pain-relieving *endorphins* in the brain triggered by very pungent food produce an opiate substance and its pleasurable after-effect.

Whatever the reason, once you develop a taste for pungent food, your body and soul crave it in spite of the runny nose, teary eyes, burning mouth and rumbling stomach, which are common side effects.

A group of six chemicals called *capsaicinoids* cause chili's pungency. The dominant compound is *capsaicin*. Each of the six chemicals has a different effect on the palate and the mouth. Some give a slow but long-lasting burning sensation. Others produce a rapid, powerful burn that sends you immediately for water, tortilla, beer, anything that may help to put the fire out. Depending on the ratio of these six chemicals, each chili has different burning sensation and pain in the mouth. But all these sensations are relatively and mercifully short-lived.

Capsaicin is almost entirely in the veins (also called placenta) inside the chilies. The seeds and flesh contain very little or none. You can prove this by carefully removing a seed from a hot chili, making sure that it doesn't touch a rib, put it in your mouth and chew it. You should feel nothing but the tiniest pungency. The most capsaicin is near the stem end of the chili. The tip is usually a little milder. The capsaicin content doesn't increase much with the ripening process, so unripe chilies can be as hot as ripe.

How hot is your chili?

Food scientists and chili aficionados used to rate the pungency of chilies subjectively by having trained tasters test and compare them. The problem with human tasters is that the taste buds fade over a relatively short time, and they need to recuperate often. They desperately needed a more scientifically-based pungency test.

An American pharmacist named Wilbur Scoville finally came up with the first usable rating in 1911. Modern science has added instrumentation to the rating system. In the Scoville test, the chemist dissolves the capsaicinoids from the chili, then dilutes it with water. What rates each chili is, with how much water the chemist needs to dilute the sample to a standard degree of pungency. If one unit of water is used, the chili is said to have the pungency of 1 Scoville unit, that is a barely

detectable pungency. With 100 units of water, the chili has a pungency of 100 Scoville units. That is still a very mild chili.

Hot chilies have thousands Scoville units. *Jalapeños* test out at 2,500 to 5,000, *tabasco* and *cayenne* at 30,000 to 50,000 Scoville units. The hottest chili and most pungent food known is the *habanero* pepper (not *habañero* as it is commonly misspelled), originally from Brazil but cultivated in Cuba (the name came from Havana). It measures 300,000 on the Scoville scale! Not all *habaneros* are quite that hot. The highest ratings are consistently from chilies grown on the Yucatán Peninsula of Mexico. *Habaneros* from California and Texas, and similar chilies called *scotch bonnets* from Jamaica, are not quite that hot but you still need to be extremely cautious to go near them. *Habanero* chilies are so hot that if you cut one with a knife, then cut a bell pepper with the same knife, the bell picks up enough heat to give you a complete surprise.

The Scoville unit is a good, reliable system for commercial purposes, and now no one relies on human tasters. Originally, even with Scoville tests human tasters tested the diluted liquid to judge for identical pungency levels, but today an instrument tells you not only the exact amount of capsaicinoids present but the relative amounts of the six different types.

A chilihead introduced a new system in New Mexico called the Official Chile Heat Scale that rates chilies on a scale from zero to ten. This has become the "in" rating for chiliheads, but the scientific community and food processors are staying with the Scoville system.

Next time you eat hot Mexican or Thai food, remember that the capsacinoids, that give your mouth a burn, don't dissolve in water, but do in alcohol, acetone or ether. Acetone or ether will kill you shortly after it relieves the burning sensation (and eating some chilies you may think death is a relief). That leaves alcohol. Rinsing your mouth with a high concentration of it helps considerably. Tequila goes with chilies like white wine goes with fish and so does beer. Milk or any milk product containing the protein *casein* is also good, as casein chemically bonds with capsaicin and removes it from your mouth. That may be the reason why cooks often accompany spicy East Indian curries with yogurt and hot Mexican dishes with sour cream. Remember, too, that capsaicin is an oil. Chewing on something that soaks up the oily substance in your mouth, like a piece of bread or tortilla or chapati, is also helpful. Water is the worst remedy—it is no help whatsoever against capsaicin.

TASTINGS How prepared foods get pungent

The food processing industry does not use ground chilies and peppers for flavoring or coloring. There is just too much variation from one batch to another, from season to season, and from different growing areas. Instead, they use highly concentrated extract of the chilies dispersed through a paraffin-like stuff called *oleoresins.* Oleoresins include all the flavor and color from the chilies. Chemical companies standardize these for pungency, color and flavor. They are more hygienic than straight dried chilies, too. This material, unlike ground chili, does not deteriorate with time and always available on their shelves. (See chapter on Flavorings.)

Here are some general guidelines if you don't know how hot the chili is you are about to purchase:

- Large chilies are often mild or moderately hot.
- Larger chilies are milder than smaller fruits of the same variety.
- Very small chilies are almost always very hot.
- Chilies with pointed ends are often hotter, while ones with rounded ends are milder.

Chilies and Peppers in the Kitchen

Handling and preparation

Many cookbooks warn you about handling hot chilies—they can give your skin a nasty burn. Some cooks handle chilies without the slightest difficulty, others with sensitive skins need to take precautions. For most cooks with not cuts or abrasions on their hands, cutting open and cleaning the membrane from chilies quickly should be no problem. Professional chefs rarely use any protection, but they are careful to work quickly and to wash their hands, knife and cutting board with soapy water as soon as they are through. Soap and water are all that take to remove the capsaicinoid oils. Touching your eyes, nose or some other sensitive parts of your body (or someone else's, heaven help you) before thoroughly washing your hands is a sure route to agony.

Thin rubber gloves work well if you have sensitive skin, but it is difficult to handle small chilies with rubber gloves. Some chili authorities suggest oiling your hands for protection. They don't say how to keep a sure grip on your knife with that slick stuff all over your hands. Another author uses chlorine bleach in water for rinsing his hands while working with chilies (1 part bleach to 5 parts water). Ammonia in water is just as effective, but it has a more overpowering smell than chlorine. Both are rather hard on your skin.

Fumes that escape into your kitchen while you are working on chilies or cooking with them can irritate your eyes, nose and throat to an extreme. Always work with good ventilation. And remember, set everything up, so you spend as little touching the chilies as possible and breathing in their fumes.

TASTINGS The castrated chile
Removing the seeds and veins of chilies is considered sacrilegious in Mexico, no matter how hot the chili. The process is considered castration and the product is called *capone*, which mean castrated rooster.

Roasting and peeling

Roasting and peeling chilies is a chore, and it is debatable whether the amount of additional flavor justifies the effort. Chiliheads and serious chili-eaters roast routinely and they swear by the process. There’s no doubt, roasting brings out full chili flavors, it adds earthy and smoky tones and tames the raw vegetable flavors. Peeling removes the membrane that toughens on roasting. With experience roasting and peeling are relatively easy.

You don’t need to peel young chilies, but as they mature the skin tends to toughen, and peeling is unavoidable. Test an unknown chili by popping a small piece in your mouth before going to the trouble of peeling it.

Peeled chilies have a more subtle and tender flavor, bright color and soft texture. Roasting before peeling enhances and adds to the flavor. You could make a full-time hobby of collecting the many methods of roasting and peeling chilies. There are so many different varieties, that what works for one may not work for another. No matter what method you use, the first step is to cut a small slit in the chili to keep it from exploding during the process. The skin on chilies and peppers is airtight to keep out moisture, pests and microorganisms. You start to heat that up, the moisture inside turns into steam and it explodes like an overinflated balloon.

You can roast chilies on a barbecue grill, over the flame of a gas stove or under an electric broiler or in a very hot oven. Turn them often so they roast uniformly and acquire a dark, blistered but not burned skin. Oven roasting a 550°F (290°C) is quick and efficient and you don't need to bother turning them. It takes 3 to 7 minutes and the chilies are ready. I even know someone who uses a small propane torch to roast his chilies—unorthodox but effective, though with this method the fine roasted flavor doesn't have the chance to develop. Torching is much too fast.

Commercial kitchens often have a large pot of hot oil sitting on the stove. Cooks drop the chilies right into the hot oil until they blister the skin (just a few seconds), then they dump them in cold water. The skin just slips right off. Stir-frying them whole in a little oil in a hot wok is another good way to blister the skins.

Some cooks also roast bell peppers. The process creates an entirely different-flavored vegetable—it is neither like raw, nor like cooked pepper. Bell peppers are easier to roast than chilies because they are larger. You cut them open, clean out the insides and lay large pieces flat on a baking sheet, then you broil them close to the heat without turning. After you well-charred the skin to nearly black, you steam them in a tightly-closed plastic or heavy paper bag for 15 minutes to soften the skin, and it peels off easily. No matter what method you use, the steaming in a bag helps to remove the skin with ease.

As with fresh chilies, roasting also enhances the flavor of dried chilies. The method recommended by Mexican cookbooks is to dry-roast in a hot, heavy pan after you've removed the stem and seeds. You need to turn the chilies constantly—not a pleasant task because of the smoke and pungent fumes. Your other choice is oven roasting in at 350°F (180°C) oven for about five minutes. You don't need to turn them, but be careful not to scorch or they turn bitter.

After roasting, cover the chilies with near-boiling water, put a weight (a plate, for example) on top so they remain submerged and let them soak from 20 to 40 minutes, until they feel soft. The thicker the skin, the longer they need to soak. When they feel soft, the skin slips off readily. An alternative method of skinning is to cut each open, lay it flat on a cutting board skin side down and with a small knife scrape the soft inside portion out. They are ready to mix it with other recipe ingredients. Save the water you soaked the chilies in for liquid called for in a recipe for added mild chili flavor. You don't lose the nutrients that way either.

Cooking with chilies

Bell peppers and other mild pepper varieties, such as the Italian frying peppers and Hungarian wax peppers are good not only in cooking but either raw as in salads, marinated or pickled. Hot chilies' place is predominantly in cooked dishes and some as pickles. Chiliheads, of course, eat them in any form or shape in any part of a meal, preferably at three meals a day.

Unlike bell peppers that have simple culinary applications, chili peppers have a wide range of use—as fresh-cooked vegetables, condiments and pickles, fresh in sauces, dried and ground into a fine powder, or dried and rehydrated. Besides flavors, those that had turned red or orange on the vine lend striking colors to dishes. The black, brick red and chocolate brown chilies also give extraordinary, sometimes even bizarre, colors to food.

When you use dried varieties, remember that chilies are dried outdoors, and what you buy are not always clean. Wash them thoroughly under running water before using.

The amount of ribs you remove determines the pungency of what you put in the dish. The more veins, the more fiery the product. A technique used in the Yucatán in Mexico, home of the fierce *habanero*, is to shred the bottom end of the chili with a knife into ragged slivers leaving the

top part intact, and dunk it in the sauce a few times. Even this brief contact transfers enough stinging capsaicin to the dish to give it piquancy but not extreme heat. Mexicans call it "walking the chili through the sauce."

To reduce the piquancy of a hot dried chili, add vinegar to the hot water you soak it in at the ratio of 2 tablespoons vinegar to 1 cup water.

One-day pickled pepper

Pickles are universal favorites but good commercial pickles are as uncommon as fresh peaches in January. Home pickling today is just as rare and not all home-cured vegetables make good pickles, either. Pickling is time-consuming, the results may be unpredictable, the jars take precious storage space and most pickles take many months before you can relish them. Besides, good pickling is hard to learn because you do it so rarely. You only know the results months later, so testing over and over again until just right is not like taste-testing fresh-cooked tomato sauces.

But some vegetables pickle rather fast. The process is not the same as long-term pickling but the flavor is quite close. This one-day pickle is really very good, and requires minimal effort. It beats just about any commercially pickled peppers you ever tried.

Ingredients

3 cups water
¾ cup cider vinegar
¼ cup sugar
4 teaspoons salt
2 teaspoons pickling spices
1¼-1½ pounds (570 to 680 g) bell peppers, cleaned, seeded, cut into strips (for color, use one red bell)
1 clove garlic, peeled
1 hot chili, a slit cut into one side

Procedure

1. Heat water, cider vinegar, sugar, salt and pickling spices in a pot large to accommodate all the peppers on high heat. When boiling, add the peppers, bring the liquid back to boil, turn the heat low and let the peppers simmer in the covered pot for 5 minutes.

2. Remove the pot from heat, add garlic and chili, cover and let sit for 10 minutes.

3. Place peppers, garlic and chili in a one-quart jar, pour hot liquid over until the peppers are covered. Place the lid on and let peppers marinate for one day on your counter, then refrigerate. They are ready to eat in a day. These pickles keep well for several weeks in the refrigerator.

Makes 1 quart pepper pickles.

TASTINGS Measuring guide

- 1 tablespoon ground medium-hot chili is about equal to 1 *ancho*, *mulato* or *pasilla* chili.
- ¼ teaspoon of ground *cayenne* or other very hot chili is equal to 2 *cayenne* or

pequín chilies.

Preserving chilies

Mature, fully ripe chilies and peppers are near the end of their lives and have a shorter shelflife than those still green. For longer freshness store all fresh peppers and chilies in the refrigerator like other perishable, living vegetables. The method that preserves them longest is wrapping in a paper towel or paper bag, then placing in an unsealed plastic bag to allow some air circulation. Roasted and peeled chilies and peppers freeze well. For cooking, chopped peppers in the freezer are great convenience. A brief blanching in boiling water improves their flavor and storage life and is worth the extra effort. For even better convenience, freeze them first on a large cookie sheet spread out in single layer. When frozen, transfer them into labeled, dated, airtight plastic bags. You can take out little bits at a time from the individually frozen pieces.

As with all spices, the finer the size of the spice, the shorter the shelflife. It is best to keep whole spices and grind them when needed for optimum flavor. Chili and paprika are not easy spices to grind fresh and even the fussiest cook buys them ground. How do you keep them long-lasting and fresh if you are a purist? In the freezer. Keep only a small supply on your spice shelf for regular use and you maximize their flavor.

MUSHROOMS

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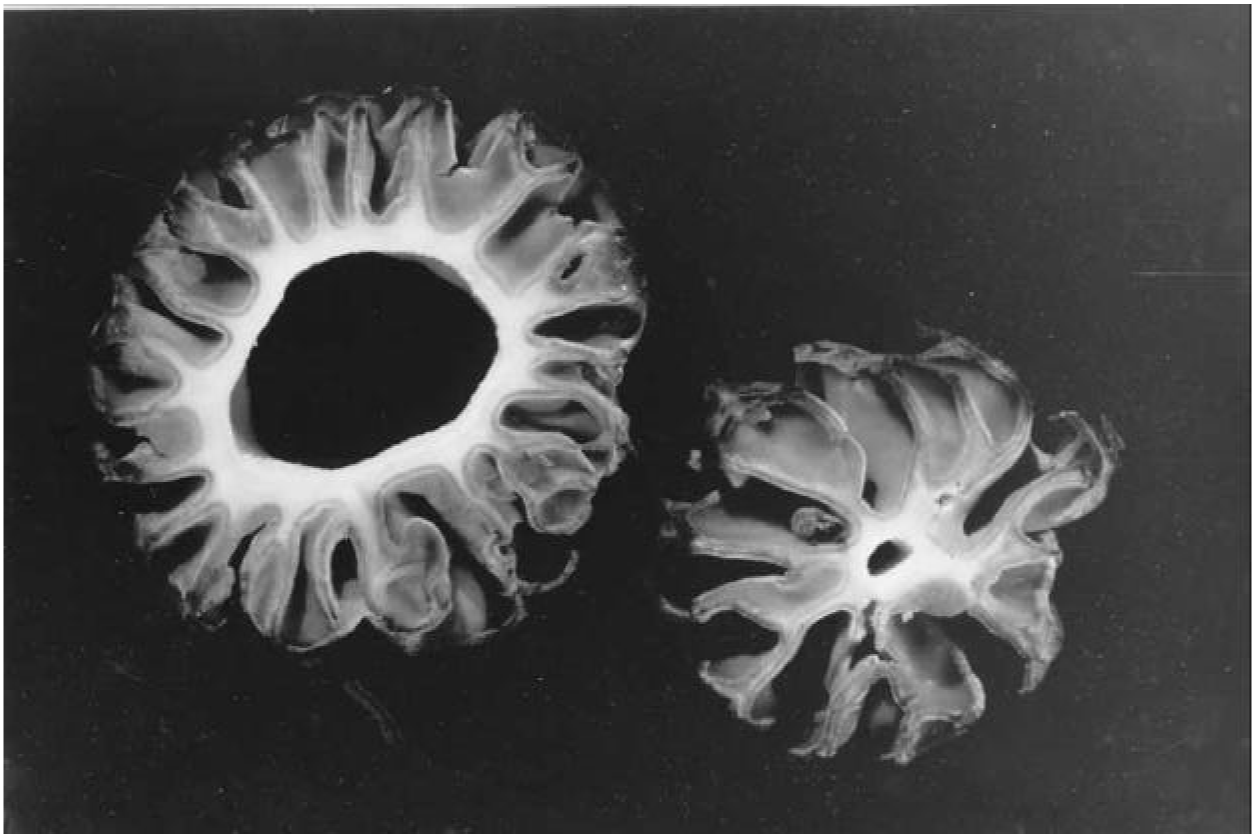

Slices of morel, a wild mushroom

Fungus in our kitchens? We have two basic types. We are not overjoyed at the sight of the ugly green kind that grows on forgotten leftovers in the refrigerator. The second type is true mushrooms. If these also grew naturally and in abundance in our kitchens like the ugly green stuff, we could all start lucrative businesses, especially if our kitchen mushroom patches produced the exotic kinds for which lovers of good food pay more than for a cut of beef tenderloin.

Neither fish nor fowl

It is hard to believe that the mushroom, a prized ingredient in many elegant dishes, is a simple fungus. Although it usually appears in the vegetable section of cookbooks, mushrooms are actually the fruit of underground fungi.

To propagate the species, these fungi produce spore-bearing mushrooms which push up through the earth. Mushrooms mature fast, produce and disperse their spores, and just as quickly die. A mushroom's life, like that of fresh fish, is measured in days.

Unlike almost all other plants, mushrooms contain no green chlorophyll that helps a plant manufacture its food from light, carbon dioxide and water. Mushrooms grow on, and feed from, fresh and decomposing organic material in the ground or on wood surfaces.

These exotic "vegetables" grow virtually everywhere in the world. Their spores are so tiny and light that moving water or air currents readily disperse them over long distances, hundreds and thousands of miles. That explains why they are so widespread, and also why the same types occur throughout the world.

Life cycle

A mushroom starts from a very tiny seed-like material, called the spore, which drop down from the umbrella of the mushroom. A spore is so tiny that its size is no bigger than a grain of icing sugar. You may not be able to see the individual spores, but what you can see is the accumulation of fine powder made up of billions of spores that collects under the cap of the mature mushroom. Like you would see the dusting of icing sugar on an almond bar .

Here is how mushrooms grow. A microscopic thread-like strand (called the *hypha*) grows from the spore and spreads in the soil under suitable conditions and having available organic food material. This thread continues growing and branching, eventually forming an entangled, very fine three-dimensional mass (called *mycelium*) that is visible to the naked eye. This network of threads completely penetrates the organic food source like mold and it keeps growing as long as a food source is available.

The fruit of the fungus, the mushroom itself, will not sprout from this network of threads until a sudden environmental change occurs that triggers its growth. It could be a change in moisture level in the soil or temperature of the air. That is why mushrooms in the wild appear in abundance particularly in the fall when both temperature and humidity suddenly change and both the soil and air are moist. The sudden change in spring is not as favorable for mushroom because spring often brings dry conditions.

Once the change occurs, mushrooms shoot up almost overnight and in large numbers. "Mushrooming" is a common metaphor for a quick proliferation of anything.

Take a closer look

Mushrooms come in all different shapes and sizes. The common domestic variety in supermarkets is a gilled mushroom. It has three basic parts, the cap and on the underside of the cap is a ribbed structure called the gills. The cap and the gills are the parts we usually eat. The third part is the stem, edible in some mushrooms but may be tough in others. The gill produces the tiny spores. The common button mushroom and portabella are examples of gilled mushrooms.

The second type of mushrooms don't have gills but a network of tiny, barely visible pores on the underside of the cap. These are the pore mushrooms and in this type the pores produce the spores. Pore mushrooms are often very meaty and plump. An example is the porcini, an exotic mushroom now available in fancier food markets.

> **TASTINGS Hallucinogenic mushrooms for a trip?**
> Some mushrooms can transport you to a different level of consciousness. These hallucinogenic types played, and continue to play, an important role in ceremonial and religious celebrations of native tribes throughout the world. They are a number of wild species that contain psychedelic compounds in the form of the alkaloid *psilocybin* or *psilocin*. Don't look for them in your supermarket produce section.

A third type of mushroom has a different anatomy altogether and doesn't even have the common mushroom shape. There is no cap, no gills or pores and no stem, just a weird-shaped body. The morel, familiar to many of us, is a good example of this type. The spores in this mushroom grow either within the fungus or on the surface. If they grow inside, the billions of spores anxiously

wait for a triggering action, like someone kicking the dried mushroom, to release them in a cloud that scatters in the breeze over a wide area.

The exotics

Besides mild-flavored domestic button mushrooms, there are a huge number of good, edible varieties that we only know from the wild. Though most defy domestication, there is more and more success of growing them on mushroom farms. These are the exotic mushrooms. Prices are high, though several varieties are readily available in larger supermarkets at almost any time of the year since about the mid-1990s.

In European farmers' markets, wild exotic mushrooms are commonly available. A government mushroom expert is even on site at many of these markets to inspect any wild mushrooms for sale and approve their edibility. In North America there are strict regulations controlling the selling of wild mushrooms to the public, yet they are available through mail-order and are imported in dehydrated form at astronomic prices.

> **TASTINGS The first cultivation**
> Our common button mushroom cultivation *(Agaricus bisporus*) started in France around 1650, predictably so, as the French cuisine has always used mushrooms extensively. Their cultivation spread to England in 1831 and from there to the rest of Europe. But in the Orient, mushroom cultivation is far more ancient and they are able to grow some half a dozen different species.

Exotic mushroom growers depend heavily on the better class restaurants for sales. The addition of a few pieces of these mushrooms to a dish justifies not only adding the mushroom's colorful name to that menu item, but the a hefty price that appears next to that menu item, far more than the cost of the mushroom itself. But these mushrooms do add excellent flavor and texture, too.

Below is a table that lists the exotic mushrooms, some common, others rarely available.

The exotic mushrooms

Name	Description	Remark
Crimini, also Italian field, Italian brown, Roman mushroom	Variety of the common button mushroom, but cap is brown and has more flavor. Harvested in the button stage.	Costs about twice the common button mushroom.
Portabella	Crimini mushroom that is allowed to mature into a large cap. Darker in color (because of chocolate brown spores). Flavor is more intense than crimini's.	Costs more than crimini.
Oyster, also pleurotus	Delicate flavored, mild, white with yellow or creamy tinge, pleasant chewy texture. Has short, crooked, off-centered stem, funnel-shaped body. Stems too tough to eat.	Cost 2-3 times button mushroom. Available fresh and dehydrated. Grows in the wild.
Shiitaki, also black mushroom, black forest mushroom	Very flavorful, with a smokey, meaty taste and a tan to dark brown cap. The stems are usually tough and unusable.	Japanese cultivated shiitaki for centuries. Close relative grows wild in North America. Costs about 5 times the button mushroom.
Enoki, also enokitaki, velvet stem, Christmas mushroom	Long, thin white stem, tiny button cap. Many stems join at the base in a clump, forming a cluster. Not much flavor but great for garnish, in soups, salads.	Grows wild and common in winter. Costs about 5 times the button mushroom.
Porcini in Italy, cèpe in France	Pore mushroom, very tasty, fleshy, meaty, earthy and fragrant.	Only grows in the wild. Rarely available fresh but sold dehydrated at about $80 a lb ($180 a kilo).
Morel	Flavor is wonderful, but not exceptional enough to justify its price. Neither gilled, nor pored mushroom. Cap is like an elongated cone with a rounded-off top. It sits on a short, stubby, ridged stem. Both cap and stem are hollow inside. The outside of the cap is full of ridges and pits, almost like a dried-up apple. Its color may be yellow, white or black in the wild, usually black in the supermarket.	Only grows in the wild. Costs 10-12 times the button mushroom when available fresh, except in good season. Available dehydrated at about $120/lb ($270 a kilo).
Chanterelle	Has a vase-shaped, irregular, thick stem, and a curly, irregular, cracked, fleshy cap with a rich yellow or orange color and a full, earthy flavor. The most common type is the yellow chanterelle.	Only grows in the wild. When available fresh, it costs about 8 times the button mushroom. Dehydrated about $80/lb ($180 a kilo).
Hen of the woods or maitake	Excellent-tasting brown or grayish brown mushroom. Grows in large gregarious clusters of many hugging individual mushrooms with overlapping caps rising from a common, fleshy base. The group looks like a fluffed-up hen. Neither gilled, nor pore mushroom. Has small spoon-shaped caps and rough, often tough off-centered stalks.	Grows in the wild and in cultivation. When available in the fall, price is about 5 times the common mushroom's.
Black fungus, also cloud ear, tree ear, wood ear	Looks very unappetizing dried but billows up into a cloud or wrinkled ear shape when soaked in water. It adds chewy crunchiness to a dish, soaks up flavors of other ingredients but has little flavor. Slightly rubbery, gelatinous texture, not for everyone. Neither gilled, nor pore mushroom, has no stalk. Brown when fresh, black when dried.	Used extensively throughout the Orient. In America available dried, very inexpensive.
Paddy straw mushroom	Not flavorful but very common Oriental mushroom, similar role as black fungus. Mild, delicate flavor, not as rubbery texture. Dark brown, small gilled mushroom.	Grows wild on rice paddy straw in the Orient and widely cultivated. As common there as button mushroom here. Inexpensive dried.

Matsutake	Gilled mushroom with thick, meaty, very flavorful white flesh, spicy, fragrant or even fruity aroma. Resembles portabella.	Japanese wild mushroom but a close relative is common in the wild in North America. Rarely available fresh at price about 70 times button mushroom's, also canned (not very good).
Truffle	Highly flavored, rare fungus with high MSG content. (See note in text).	Demand far exceeds supply so price of good, fresh truffle is about $1300/lb ($3000 a kilo).
Oregon white truffle	Choice fungus but nearly extinct. Close relative of truffle. (See note in text).	When available fresh, price is $150-200/lb ($335-450 a kilo).

The elusive truffles

Finally, let's focus on the elusive truffle, a fungus that most of us will never have the chance to taste because the demand far exceeds its supply. It is said to have a wonderful flavor but, like its highly overrated companion, caviar, it is reserved for wealthy diners.

Truffle is also called earth nut. This name describes its natural habitat—underground. The truffle is small and knobby, and one can mistake it for an acorn or a rock. It has no stem. The solid interior has the consistency of wax, and it chips into flakes, like candle wax.

Truffles have an unusually high glutamic acid content (naturally occurring monosodium glutamate, MSG). This partially explains their popularity in the kitchen. They not only contribute their wonderful mushroomy flavor, but also accent the flavor of any food, as is characteristic of MSG (see Flavorings chapter).

Truffles grow in a symbiotic relationship with certain trees, mainly oaks. Since they grow underground, the truffle hunters who know where they have been found before have a better chance of finding them again. If you don't have that knowledge, you can always hire a trained truffle dog or pig who can smell truffles from the surface and signal where you should dig. In the case of pigs, who have a taste for truffles themselves, you must muzzle it or there won't be anything left to bring home.

A musky-smelling chemical both in the saliva of the male pig and in truffles make female pigs such superb truffle hunters. That scent has a most aphrodisiac effect on female pigs, inducing mating behavior. There is no such effect on dogs, but with their good sense of smell and hunting instinct, people train them to search for truffles.

It is interesting to note that researchers found human males having this same chemical in their underarm sweat. Does that mean that human females are better at sniffing out truffles than males are? The theory has not been tested yet, but keep it in mind if you embark on a truffle trek.

True truffles are only found in Europe. The most famous of all, the black truffle, grows in the Périgold area of France and adjacent Spain. Its almost as famous neighbor, the white truffle, appears in Northern Italy and the adjacent former Yugoslavia.

Because of their scarceness and popularity, many attempts have been made to cultivate truffles. A truffle farm would be as lucrative as gold in the California Mother Lode. But so far, no one has been successful. Some hopeful French growers in 1978 were able to produce only a small quantity. An entrepreneur in Spain who planted evergreen oak trees and truffle spores over a large acreage in the early 1970s expected to start harvesting them in the early 1990s. In fact, he successfully harvested a small crop in 1993, which was predicted to increase dramatically in following years. If you find a great drop in truffle prices, you will know his expectations were fulfilled.

We have several closely related truffles in North America, but connoisseurs only considered one, the Oregon white truffle, as choice that comes anywhere near the flavor of European truffles. It has been hunted to near extinction. This fungus grows on the surface, not like its underground European counterpart. Oregon white truffles are not often available, and when they are, at $150 to $200 a pound ($335-400 a kilo), they are kept in a locked cabinet. You may find them in a high-priced specialty food store and through mail-order suppliers.

But that is nothing compared to the true black truffles, which sell for $1300 a pound ($3000 a kilo). They are probably kept in a bank vault and weighed out with a jeweler's scale with an armed guard standing by. Needless to say, you will not find truffles on the produce display of a supermarkets.

Truffles are also available frozen if special ordered, but unfortunately, their frozen state doesn't lower the price.

How they grow mushrooms

We can pick mushrooms in the wild but most of us prefer to pick them in the market's produce department. Only a few types of mushrooms have adapted well to domestic cultivation. What we use mostly is the common, ordinary white mushroom that distributors call button mushroom. It is scientific name is *Agaricus bisporus*. The wild ancestor is far more flavorful than its commercial counterpart. Consumer demand for a uniform product and producers' requirements for long shelflife, high yield and disease resistance have taken their toll on the flavor of the domestically cultivated version. Also, most consumers prefer a milder, less aggressive flavor. The wild ancestor, indeed, can have a powerfully mushroomy flavor that would no doubt overwhelm average taste buds.

Mushrooms enjoy worldwide cultivation, especially in the Orient, in Western and Central Europe. Logically, those countries whose cuisines use a lot of them grow the most, and mainly by thousands of small individual growers.

> **TASTINGS The cultivated kinds**
> Commercial button mushrooms make up 60 percent of total world production, shiitakes represent 14 percent, oyster and paddy straw mushroom 8 percent each. All the other exotic species make up the remaining 10 percent of the total. Commercial growing of exotic mushrooms in North American only goes back to the early 1980s.

In North America, a few very large and many small growers supply commercially. The smaller growers distribute to local markets. Some growers are even "back yard" farmers, raising just enough to supplement incomes. Growing mushrooms, however, is tricky. I still remembers the next door neighbor's attempt to grow mushrooms in his basement while I was a kid in a small city in Hungary.

The beginning phase was awful. A large horse-drawn wagon that stank to high heavens slowed down in front of the house one sunny autumn day. Instead of moving on, it turned into the neighbor's backyard. My family and I watched with horror as the neighbor opened his basement window on the side of his house facing our dining room window, and the cart owner filled the basement with the smelly stuff that my mother clearly identified as horse manure.

Apparently the neighbor did not violate any city code, and my mother's mild complaints to the neighbor did not help. He assured her that once he closed his basement window there would be

no smell. That wasn't exactly true, but, after a few days, the smell did subside considerably. When I walked over to inspect the operation a week later, the smell, even in the basement, was tolerable.

The neighbor had mixed the manure with straw and piled the mixture on his basement floor in long, narrow, parallel ridges. He must have known what he was doing, because in five to six weeks' time the mushrooms started maturing in staggering numbers. I had ample opportunity to watch the operation closely because my mother sent me over every few days to buy more fresh mushroom for her cooking. Everyone in the neighborhood became frequent and enthusiastic customers. The fresh-picked mushrooms were excellent in cooking and were inexpensive. Fortunately, most kids liked mushrooms, too, because they appeared on the menu almost daily. The harvesting went on for several months.

The next year, a wagon full of manure arrived again, and this time, anticipating the wonderful fresh mushrooms to come, we ignored the smell. However, something went wrong. Even though the neighbor did everything the same as the previous year, very few mushrooms grew. There were just enough to supply a few neighbors. That was the end of the neighborhood's mushroom adventure.

Mushroom growing is a finely-tuned microbiological science and many of the growers, particularly the small ones specializing in exotic species, have a microbiology background. Without that knowledge and plenty of growing experience, mushroom cultivation is unpredictable.

The stages of mushroom growing

In a commercial operation, mushroom cultivation is in temperature and humidity-controlled windowless greenhouses, tunnels or caves. There are five major steps to readying a mushroom for your pot.

1. *Substrate preparation*. Substrate is the organic material that the mushroom uses as its food source. Carefully preparing this determines both the size and quantity of the crop. Different cultivated species flourish in different substrate.

All substrates are high in cellulose, which the mushroom organism breaks down and uses as food energy. Few other living organisms are able to break down cellulose. (Exceptions are wood-eating termites and hay-eating mammals.)

Most substrate is inexpensive straw which the growers keep damp for about two weeks, then add specific material that helps the straw compost, such as chicken manure, gypsum, cotton seed hulls and other organic material. After a few weeks of composting they use steam to pasteurize the substrate and to remove the ammonia. Some growers use huge pressure cookers at high temperature to provide a sterile substrate before they introduce the spawn, so that no other organisms can take over.

A successful mushroom farm is kept scrupulously clean and sterile, just like a microbiology lab, so you need not worry about where a mushroom has been before it turns up in your kitchen. Even if it is manure, it is a sterile manure. Contamination only comes in subsequent handling.

2. *Preparation of fungal culture and spawn.* The fungal culture is the initial growth from mushroom spores. They nurture spores in a petri dish under sterile laboratory conditions. Once the fungal culture covers the dish, they transfer it to a larger food source, usually moist rye or millet grains in a jar, to give the culture a good, healthy start.

Eventually the fungus colonizes the grain, penetrating it fully. This is called the spawn or *mycelium*. Sometimes mushroom farms buy this already developed from spawn companies ready to inject into their prepared substrate. But many farms develop their own, using spores from a

particularly nice crop, or culture an exceptional specimen they have found elsewhere.

3. *Spawning*. This is the process of introducing the spawn into the substrate. It is a simple physical process. If the substrate is wood, they drill it full of holes, place a little bit of spawn in each and they seal off the hole. If the substrate is loose organic material, they pack it into large containers lined with sterile plastic sheeting, and they inject the spawn with sterile needles or some other means, making sure no other organism can find its way into it. In larger facilities, special spawning machines do the spawning that mix the compost and spawn mechanically, sometimes also blending in additional nutrients.

4. *Mushroom production*. When the entire substrate is completely penetrated with the still growing and spreading spawn, it is time to introduce a change to trigger the growth of the mushrooms. Depending on the species, the change may be lowering or raising temperature and humidity, turning fans on for air movement, or turning on strong lights. Often, they use a combination of these. It is an art.

For our common button mushrooms, for instance, they move the blocks of substrate to production rooms, and they lower the temperature of the compost by 2°F (1°C) every day. They water the blocks twice a day to increase the moisture content. As the mycelium gets colder and wetter, it starts shooting rootlike projections toward the surface of the compost. Each of these (called *rhizomorphs*) is tipped with a mushroom pin, an incipient mushroom that begins to grow. This stage takes about 3 weeks.

5. *Harvesting the mushrooms.* Mushrooms continue to develop for 5 to 6 weeks until they exhaust the food source. The temperature of the compost, relative humidity and carbon dioxide content of the air are all important for maximum yield and growers must continue to carefully control them throughout the harvesting phase. If carbon dioxide is too high, for example, mushrooms stop growing. If humidity is too high, the mushroom caps become sticky and clammy, and begin to deteriorate before harvesting. If too low, the mushrooms start drying out.

If the grower neglects the slightest detail, there may be no mushroom growth at all. Pure scientific knowledge of the fungus is important in the mushroom-growing process, but experience and intuition are equally necessary. No wonder my childhood neighbor in the story above had such poor success in his second attempt.

TASTINGS Mushroom harvest
The average yield is about 3 pounds of mushroom per square foot (14½ kg per square meter) of compost surface. It can be as high as 6½ pounds per square foot (31 kg per square meter) if the grower takes great care of every growing phase and is experienced.

Mushrooms in the kitchen

Mushrooms are not a particularly nutritious food, but few people are thinking of nutrition when they bite into a perfectly prepared specimen. They are high in protein compared to other vegetables, but in an absolute sense, they are still a low-protein food. They contain lots of vitamins B_2 and B_3, a significant amount potassium and a moderate amount of phosphorous.

The mushroom's job is to add flavor, texture, eye appeal and richness to a dish or plate of food, not nutrition. Western cuisines tend to use mushrooms mainly for flavor, although the subtle mushroom texture is an important part of many dishes that don’t require long cooking. Most kids

don’t care for mushrooms probably because of their texture.

Marinated mushrooms

Try this recipe for an excellent marinated mushroom. It is simple, easy, gives firm crispy mushrooms with good herb flavor and just the right balance of oil and vinegar. However, this has a short shelflife. In fact, I don't suggest you put them on your shelf at all. They will still be good about a day after you made them, but that approaches the upper limit. They become mushy and darken after the second day.

Ingredients

1 pound (450 g) small button mushrooms, quickly washed in a bowl of water, drained
1 cup Italian herb dressing (preferably your own)
¼ cup red pepper or pimento in thin slivers or tiny squares

Procedure

1. Combine mushrooms and dressing (which serves as a marinade in this case) in a stainless steel, glass or ceramic bowl or in a large jar with a tight cap about 4 to 6 hours before serving time. Mix thoroughly so mushrooms are well coated.
2. Let mushrooms marinate at room temperature mixing them every hour or two to recoat surfaces with fresh liquid.
3. Drain marinade, mix mushrooms and red pepper or pimento and arrange them neatly with all caps facing up in a serving bowl.

Serves 15 to 25 guests as hors d'oeuvres or 8 to 10 as extra item on your dinner table.

In Oriental cooking, their texture and ability to absorb other flavors from the liquid are more crucial. Japanese cuisine in particular adore mushrooms for both flavor and texture. That is why the cultivation of so many flavorful mushrooms originated in Japan.

Mushrooms add a chewiness that is pleasing even if the flavoring effect is modest using milder mushrooms. In fact, some of the dried Chinese mushrooms match tofu in blandness, but cooks use them extensively for texture, color and to absorb the flavor of the sauces.

The mushroom's very pretty, appealing shape in food presentation has made it even more trendy among contemporary cooks and chefs, particularly in white tablecloth restaurants.

What to choose in cooking

So what type of mushrooms should you use in your cooking? If you have an unlimited kitchen budget, use fresh black truffles ($1300 a pound or $3000 a kilo) and morels from France. They will be a sure hit among your guests, particularly if you can weave their cost into the dinner conversation. But most of us work with a more limited kitchen budget in which the other end of the spectrum is the more likely scenario, even considering to rescue the mushrooms on the "reduced-for-quick-sale" shelf of the supermarket.

For most everyday cooking, fresh button mushrooms are perfectly adequate. When you want to splurge a little, one of the more common exotic types is a nice addition to your menu.

Remember, a little mushroom goes a long way. Two ounces (55 g) of an exotic mushroom per person is plenty to get the full benefit of mushrooms when you mix it with other ingredients in a side dish. So 1 pound (half a kilo) serves 8 guests—not an outrageous expenditure for an elegant meal. To make the price even more reasonable, mix the exotic mushrooms with button mushrooms half and half. You will still get the flavor and visual impact of the exotic mushrooms. You can also blend fresh button mushrooms with dried reconstituted exotic mushrooms for their added flavor. Use 1 or 2 ounces (30 or 55 g) of dried mushroom for every pound (half kilo) of fresh mushrooms.

Mature mushrooms are always more flavorful than younger ones. Both the umbrella shape and the deepening color of the "ripe" spores indicate a mature mushroom. Don't use quite as much of a mature specimen as you do the same mushroom in the button stage.

A flavorful exotic species like the chanterelle goes with any robust, full-flavored dish, while the milder exotics, like the oyster mushroom, are better with mild-flavored food, particularly seafood.

Some mushrooms are perfect for garnishing to add visual impact, such as the enoki. Their size and blandness are hopelessly lost among the other ingredients, but they look great as a garnish.

You may also use mushrooms raw in salads. They add visual impact to the dish with their pretty-shaped cross-section when thinly-sliced. But uncooked mushrooms are almost flavorless. Marinated or pickled, they readily absorb the flavor of the liquid in which they are soaked, thanks to their spongy flesh. A marinated mushroom retains its crunchiness, too, making it great hors d'oeuvres to serve with toothpicks.

How much mushroom should you count on for each serving? Mushrooms are 92 percent water so with cooking they shrink considerably as heat evaporates much of that moisture. Generally, a 4-ounce (110-g) serving is an adequate size when mushroom is a side dish, but for a more generous serving increase that to 5 ounces (140 g). When it is the main ingredient of a mushroom dish, such as a mushroom stroganoff and mushroom stew, increase it to 6 or 6½ ounces (170 or 185 g). For hors d'oeuvres as marinated mushrooms, count on everyone taking anywhere from 2 to 5 buttons, depending on their size and what else you are offering.

How to bathe a mushroom

Cooks have been bickering for years about the best way to clean mushrooms. Button mushrooms come to the supermarket looking quite clean. But that is not clean enough. Handling on the way, perhaps chemicals sprays make another cleaning necessary. But wait until just before ready to use them.

Cookbooks are filled with mushroom cleaning methods. According to the poplar kitchen myth, mushrooms absorb too much water when fully immersed and this is true. If you let mushrooms sit in water for several minutes, particularly if they are mature and open, the gills soak up water like a sponge. Kitchen stores carry soft-bristled mushroom brushes, yet individual cleaning of each mushroom is inefficient.

Older recipe books suggest peeling each mushroom. This is another slow, time-consuming process, and it is unnecessary. Most of the nutritional value is just under the mushroom skin, one more reason not to peel. Another method, rubbing each individually with a moist towel is also very slow. Some chefs suggest whipping a little flour into the washing water, then quickly washing the mushrooms. Supposedly, the flour prevents mushrooms from soaking up water.

I tested many mushroom cleaning methods and found the best to be the quickest. Try this method. Fill a good-size bowl with water, dump the mushrooms in it, quickly stir them up with your

hands, then pour mushrooms and water into a waiting colander to drain. In 10 seconds the mushrooms are clean and have absorbed very little water. You can test this, as I did, by weighing the mushrooms before and after washing on an accurate laboratory scale. Any increased weight, of course, is absorbed water. If you are quick, the amount is negligible.

Storing mushrooms

Mushrooms spoil quickly, much more so if you don't know how to store them. Many cookbooks suggest not keeping them more than a few days. That is overly conservative. If you buy them fresh, they will keep fine for a week, even longer, though eventually they start drying out and darkening.

The best way to store mushrooms is in a paper bag. They will keep well on an open tray covered with a paper towel or dishtowel, too. They need to have air circulation or they'll suffocate (fresh mushrooms are alive). If you keep them in an airtight plastic bag, they will turn mushy and moldy quickly. You may even have some unwanted fungus growing on your original valued fungus.

If you have bought or harvested too many mushrooms and want to preserve them for later use, freeze an extras. Cut them up and blanch them first in boiling water for 2 minutes to stop the enzymatic action that continues to mature them. Then place them in the freezer in a single layer on a baking sheet until they are solid. Now transfer the individually frozen pieces into plastic bags for storage. Don’t forget to label them. Once defrosted, they are perfectly fine for soups, sauces and cooked dishes. They will no longer produce beautiful garnishes or visual impact, of course.

Mushrooms also dry very well. Thinly slice any extra mushrooms before placing in a dehydrator. If the weather is dry, you can also string them on a strong thread with a needle and hang in an airy place to dry. Store them in a jar once they are absolutely dry. Keep the jar on your counter for a few weeks so you remember to recheck and make sure all the mushroom pieces were fully dry or they may start getting moldy.

Rehydrating dry mushrooms, whether your own or commercial, is a quick process. A few minutes in hot water, at most a half an hour, fully reconstitutes all but the toughest varieties.

The moisture content of rehydrated mushroom is higher than fresh mushrooms’. This won't affect using them in soups, sauces, stews or any other liquidy dish, but you cannot easily sauté or fry rehydrated mushrooms unless you drive the extra moisture out with high heat first.

You can also pulverize dried mushroom to make mushroom powder. It is an easy, ready food material to add to any dish that benefits from a mushroom flavor and in an airtight container it has a very long shelflife, probably years.

Duxelles is a mushroom extract or paste, a French invention. It is easy to make when fresh mushrooms are available at a low price or when you have plenty of leftover stems when the recipe calls for caps only. Chop the mushrooms fine (you may also add reconstituted dried mushroom), sauté with onion, then season with thyme and nutmeg. Cook off the moisture and add generous amount of parsley. You can either freeze or refrigerate the resulting paste in small packets. It is good in any meat, poultry or fish dish, gravies, soups or stuffing, virtually in any food that you want to add a mushroom flavor to.

OUR VEGETABLE SCENE

All cuisines in the world offer cooked vegetables as part of their daily menu. This is a well-proven, ancient tradition—people on a habitual diet that includes vegetables had consistently better health and had a better chance of survival. Vegetables' high vitamin, mineral and fiber content is essential to human diet, thus the daily dose of vegetables kept our ancestors' bodies in good order.

Aside from health benefits, vegetables also possess wonderful flavor, appealing texture and great temptation to our taste buds when properly prepared. On today's American and Canadian tables no one considers a meal complete without either cooked or raw vegetables. Luckily, vegetables are in. Today an average supermarket caries 240 items in the produce section the majority of which are vegetables.

Vegetable cookery is simple, yet it takes a certain amount of kitchen know-how to serve vegetables with optimum flavor, best texture, magazine-cover presentation and still retain most of their nutrients.

What are vegetables

We all know that vegetables, whether edible or not, are part of plants—potatoes are enlarged parts of the roots, carrots are the roots themselves, celery is the main stalk, spinach is the leaf, artichoke is the flower and eggplant is the fruit. Mushrooms are exceptions. They don't belong in the Plant Kingdom but are fungi. Several parts of certain plant may be edible, such as the root and leaves of turnips and beets, while in some plants a certain part is edible, others may be poisonous. The enlarged root of the potato plant is perfectly healthy to eat but the poisonous leaves you want to eat only if you are contemplating suicide. Rhubarb has a wonderful edible stalk but the leaves can kill you.

All vegetables have fibers, a substance essential to human health, but some have more, others have less. Fibers give rigidity and shape to the living plant. We cannot digest fibers, which are organic substance called cellulose, so they have no nutritive values to the body. But we cannot digest our foods without them.

The vegetables that cook quickly, e.g. cabbage, have relatively low amounts of fiber, those that are slow-cooking, such as artichoke, are often high in fiber. Age also determines how much fiber a vegetable has. The older it is, the more fibrous. A young kohlrabi is soft and tender like a fresh radish, while an old one is hard to cut through with a knife, it is so full of tough fibers. The root-end parts of plants have higher fiber content than the blossom-end part. The bottom portion of an asparagus is full of coarse, tough fibers while the young top velvety-tender tips have very little.

Vegetables in the Kitchen

Cooking for best appearance

There are pigments that Nature uses to dye vegetables. Intensely colored vegetables on the plate give a great impact to our visual senses that translates to heightening appetites. Our early American heritage from English and northern European immigrants favored overcooked

vegetables, a tradition that continued until relatively recently. Overcooking kills flavor because the volatile flavor components escape with the steam, but it also kills color pigments. Compare the favor and color of overcooked green beans to crisp quick-cooked beans. Today's tendency of vegetable cookery among the new foodies is crisp, but tender—brief cooking to the point of *al dente*. But such tendency is regional. People in the southern U.S., for instance, still tend to cook vegetables longer than their compatriots on the East and West coasts.

Green is the most common vegetable color. The pigment *chlorophyll* gives the green coloration and this pigment is sensitive to length of cooking and acidity of the cooking liquid. Both destroy the pigment and change it to another pigment that has a drab, unappetizing army olive-green color. Never cook green vegetables in acidic liquid. Yet, all vegetables contain some acid and long cooking leaches those into the cooking liquid. As a result, the water becomes more and more acidic and the chlorophyll pigment disappears. Cooking green vegetables in uncovered pot is helpful because in covered pot water concentrates the acid, but without the lid much of it evaporates with the steam.

Older cookbooks suggest adding baking soda to the cooking water to make it alkaline and retain bright colors. More recently nutritionists found, on the other hand, that vegetables they cook in alkaline water lose much more nutrients than those they cook in neutral and acidic water. Hence, never add baking soda to the vegetable cooking water.

Yellow and orange vegetables owe their colors to pigments called *carotenoids*. Carrots, corn, tomato, winter squashes and red peppers carry these pigments. They are very stable in either long cooking or acids, but if you cook these vegetables very long, even these pigments transform and the vegetables' color turn dull.

Red and purple color pigments are called *anthocyanins*. Beets and red cabbage carry these. They are very stable on long cooking but prolonged overcooking still destroys them, and your beet or cabbage turns colorless. But these pigments are extremely sensitive to acidity. Acid brightens the pigments, alkali changes them to blue or blue-green as you may have noticed when cooking red cabbage. The change is not permanent—add a little acid (vinegar, lemon juice or cream of tartar) to the cooking water for your red cabbage that had turned blue, and it changes back to red.

White color pigments are the *anthoxanthins*. Potatoes, white cabbage, onion and cauliflower carry these pigments but also the white parts of leeks, celery, cucumber and zucchini. White pigments are stable on long cooking and remain stable in acidic cooking water. Alkalic water changes them to yellow pigments. So if you want your cauliflower to turn dingy yellow for your dinner guests you don't like, add baking soda to the cooking water. Otherwise a little lemon juice or other acid keeps white vegetables snow white. But prolonged overcooking or holding vegetables over heat too long also changes colors to dull yellow, grayish pink or any unappetizing shades.

Cooking methods

Vegetables are extremely versatile in the kitchen. We may use any of the following cooking methods to prepare them:

1. Boiling, blanching or parboiling. All these terms refer to the same cooking method—cooking in briskly boiling large amount of salted water, akin to pasta cooking. The reason for large amount of water is to keep it at boil as much as possible when you add the vegetables. A large body of liquid keeps its heat better than a small amount. When you add the vegetables, it

returns to boil relatively quickly. Large amount also helps to dilute accumulating leached-out acids that would change the color.

Blanching and parboiling are the same things. The terms imply cooking in boiling water until nearly cooked but still quite crisp. Once you remove the vegetables from the boiling water, you quickly immerse them in cold water to stop the cooking process (iced water, that some cookbooks suggest, is not necessary—cold water instantly stops the process and you avoid an unnecessary step of ice water preparation). Then the vegetables are ready for a next cooking step, for cold storage or as salad ingredient. Boiling is a term that implies cooking to a softer stage than blanching. Today many cooks prefer to serve freshly-blanched crisp vegetables instead of boiled.

You always add salt to the water to cook vegetables. The amount is about ½ teaspoon for every quart (liter) of water. Without salt the boiling water leaches out the vegetables' natural salt and the flavor becomes flat.

Blanching produces the brightest colored vegetables of all cooking methods. They become brighter than their natural colors. Why? Vegetables are made up of tiny cells that contain the coloring pigments. There is a thin layer of air that surrounds each cell and that layer slightly mutes the color in living plants. It is similar to looking through a fogged-up windshield. The heat in blanching removes that thin air layer from the surface cells, and the muting effect disappears—the colors become brighter, like if you had put on the defroster for your windshield.

2. Steaming is a slower process than boiling or blanching requiring nearly twice the cooking time. Many cooks swear by steaming as the method for best-tasting vegetables. But others (myself included) disagree. When you steam and blanch the same vegetable to the same degree of doneness, you notice a slight but distinct difference. Steaming does not bring the flavors out as fully as cooking in boiling water does. You may want to try it yourself and decide.

You don't need to salt the water when steaming in spite of some cookbook directions. Salt does not evaporate with the steam and the vegetables remain unaffected.

3. Stir-frying, sautéing and frying are closely related methods. All use high heat and oil or fat to prevent sticking to the pan and to develop the flavor by the browning reaction (see Browning reaction under the Meat chapter). In stir-frying you add just a film of oil, in sautéing somewhat more and you fry in deep, hot oil. When frying in a lot of oil, the cook needs to coat the vegetable with a batter, or the fast-escaping steam from the vegetables makes a terrible spatter in the oil. The coating moderates the direct contact of the hot steam and the oil, resulting in plenty of hissing and sizzling but less spattering.

4. Baking or roasting is suitable for many of the sturdier vegetables. Those with particularly high moisture content, such as cucumbers, are not suitable—by the time they are finished roasting, not much more than a brown pellet left. You always stir in a small amount of oil or fat with baked or roasted vegetables to help them brown and inhibit sticking to the pan. You may also add seasonings with the oil. Add robust herbs and spices early in the process but subtle-flavored herbs lose too much essential oil during the baking process, so it is best to add them late. For baking or roasting, use whole vegetables or large chunks. If you cut them into too small pieces, they dry out too much.

5. Broiling and grilling vegetables are just like broiling or grilling meat, except it is necessary to add some oil or fat to avoid sticking and promote browning. For this method the vegetables are often in thick slices.

6. Microwave cooking is very popular because of its speed. Many cooks believe in this method yet it is so fast that overcooking is a real danger. You leave the vegetables in the

microwave oven just 30 seconds too long, and you end up with a product ready to be puréed for baby food. Microwave cooking doesn't brings out flavors, either. Test it for yourself and compare. Cook, say green beans, in the microwave to the same doneness as green beans you cook in boiling water or in a steamer.

My memorable microwave cooking lesson was at a good friend's summer dinner party at the height of the corn season. He was a first-class gardener and his wife was a third-class cook. Unfortunately, she was the designated cook in the house. Minutes before dinner he picked fresh young corn in his backyard garden, handed them to his wife while us guests looked on in an expectation for fabulous culinary delights. Fresh-picked corn is a rarity in most of our lives and the flavor is often ahead of caviar and truffles. The corn cobs were ready in record time—she microwaved them. Instead of culinary delight it was a struggle to chew and swallow the tough, flavorless kernels. The microwaves totally annihilated them. It was a pure waste growing them since in this case frozen corn would have easily surpassed the fresh.

Vegetables at their best

For best flavor, appearance and least nutrient loss cook vegetables as quickly as possible. The quickest-cooking methods present us with most tasty vegetables—blanching, stir-frying, deep-frying, grilling and broiling. But the slow-cooking oven roasting also brings out full flavors.

When you want to cook several kinds of vegetables together irrespective of what method you use, you have two choices to arrive at vegetables with the same degree of tenderness. Either add them to the pot or pan at different times, starting with the slowest-cooking, densest vegetables then gradually adding the faster-cooking ones, or cut them into different sizes—the slow-cooking vegetables into smaller pieces than the fast-cooking ones.

You may also combine two cooking methods. For example, pre-blanching vegetables significantly speeds up grilling, broiling or sautéing. Blanching is also an efficient way of preparing vegetables to fast last-minute serving, the way restaurant chefs serve freshly-cooked crisp vegetables in the shortest time. The chef has the supply of pre-blanched, cooled vegetables ready to sauté on high heat in butter or oil and seasonings in less than a minute. Efficient home cooks do the same.

When cooking strong-flavored vegetables, such as those in the cabbage and onion families, the flavor becomes milder if you cook it in water to cover. The strong flavor components leach into the liquid. They also become milder if you leave your pot uncovered so some of the strong volatiles spread their aromas throughout your house, leaving their vegetable source behind. Due to chemical reactions, prolonged cooking increases the strong flavor of cabbage-family vegetables, but decreases the onion-family vegetables.

A useful way of concentrating flavor in some high-moisture vegetables is a technique the French call *dégorger*. The idea is to get rid of part of the water without heat. You grate or finely dice the vegetables (cucumber, zucchini, cabbage) to increase the surface area and sprinkle it generously with salt. After several hours the salt draws out some of the water that you drain in a colander or you wrap the vegetables in a kitchen towel and squeeze out the water by twisting the towel. After thoroughly rinsing out the excess salt, the vegetables are ready to sauté, stir-fry, bake or whatever method is suitable.

Points to Remember

- Use yellow onion in cooking, sweet onion for salads
- The flatter the onion the less the pungency
- For most intense garlic flavor add garlic late to the sauté pan or dishes
- Cooking ginger in water or oil mutes pungency; cooking in acidic liquid increases it
- Keep extra minced garlic and ginger in small containers in your freezer
- To ripen tomatoes, keep them out of the sun in a warm place in a closed paper bag
- Canned tomatoes are better for cooking than tomatoes out-of-season
- Chili powder is a spice mix; ground or powdered chili is pure red chili ground into fine powder
- Keep ground chili and paprika in the freezer for best flavor
- To tame chili-induced fire in your mouth, get rid of chili oil with alcohol or milk products, or soak it up with bread or tortilla; avoid water
- The ribs in the chili carry most pungency; the amount you include defines how hot your dish will be
- Mushrooms add flavor and texture to dishes; some are bland but soak up flavorful liquids
- Heating creates the flavor in mushroom; raw mushrooms are pretty but flavorless
- Store mushrooms in paper bags in refrigerator, never in plastic
- Cook vegetables with three goals in mind: best flavor, most nutrients, most eye appeal
- Cook all vegetables for shortest time possible, particularly green vegetables to preserve color. Never add any acid or baking soda to the cooking water
- One of the best vegetable cooking methods is blanching in plenty of boiling, salted water. Microwave cooking is the least suitable

Rice is the best food for the soldier
Napoleon I

THE CARBOHYDRATE CHAMPS

Food, like all good things, comes in threes. Our traditional dinner entrée features three food elements on our plates. A protein-rich food, typically meat, fish or poultry, featured as the main focus, a complementing hot vegetable which gets a smaller spotlight and a third, starchy, carbohydrate-rich item that hardly gets any spotlight at all. Here I will focus on the starch-rich foods that need to be neutral and subtle in flavor but form a foundation that balances the entrée in both flavor and nutrition. In addition, their carbohydrate content contributes substantially to filling up the diner. The cook chooses this third food item from any of a number of well-defined food: either from a root crop like potatoes, or from grasses like rice, pasta, grains and cereals.

This category is so unassuming that it even lacks an acceptable household name. The old-fashioned term "starch" comes to mind, but now this word has unpleasant overtones conjuring the image of obesity. It smacks of something fattening that you want to avoid. It is true that most foods in this category are high in starch. That is what gives them the power to satiate appetites and provide the energy for the body. Yet, all of them are moderate in calories and high in nutritional values. The calorie count goes over the top with the traditional things we add to these basics—butter, sour cream, rich sauces and fatty things.

Side dish is another term you often see in older cookbooks. Newer cookbooks prefer the term accompaniments or they may not even list them separately. They may group potatoes with vegetables, while they treat pasta and rice individually. They often leave grains dangling somewhere or even omit them altogether.

These starchy foods suffered from sad neglect, though they gained a somewhat more prominent position, even respectability on the American culinary scene since the early 1980s. Dietitians advised us that this group is not only nutritious and modest in calories, but it is the source of longer-lasting, more healthful energy than calories we gain from proteins and fats. Nutritionists discovered, for instance, that athletes on high carbohydrate foods (what they call *carbohydrate loading*) perform better than those on the high-protein, high-fat steaks, eggs and similar foods.

There is no ready solution for a good name that gives an honorable status for this group. I would like to see cookbook authors treat all these starchy, mild-flavored and indispensable food items under one single heading for ease of choosing and comparing them. To further that cause, I'm discussing all the currently fashionable choices in this single section.

PASTA

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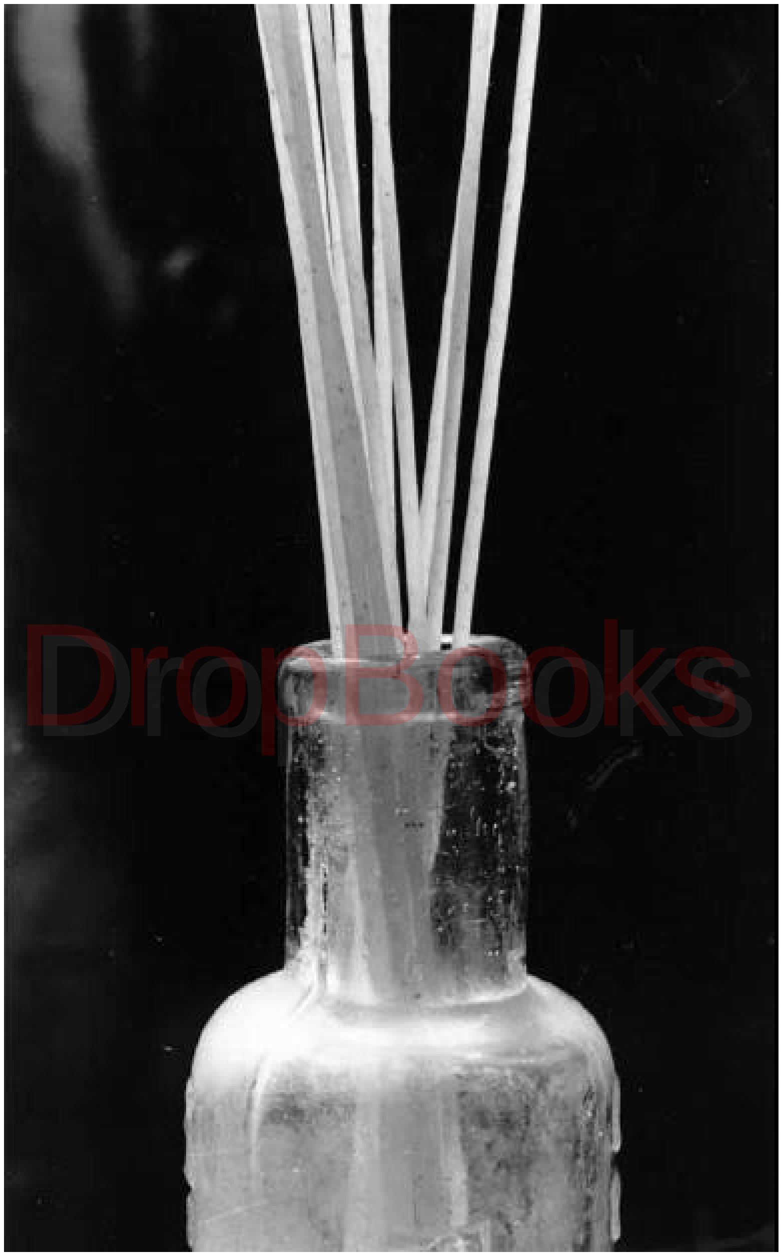
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Pasta, in one form or another, is one of the most ancient foods on human' table. Its history, its use and its popularity run parallel to that of breads, not surprisingly since both use wheat flour as the starting ingredient.

Pasta first appeared around 2500 years ago in China, though some scholars claim that Arabs in the Middle East may have been the first to grow *durum* wheat (the basic material of pasta) and may have also invented pasta. From there it was introduced to Spain when it was conquered in the 800s. Scholars think that the Roman Empire had pasta around the time our calendar started, 800 years before the Spanish. Whichever is true, it was the Italians who developed pasta-making into culinary art.

Over the centuries each local Italian pasta-maker developed its own unique shape or size, which is why we now have hundreds of kinds. By the 1700s they were able to mass produce pasta, which reduced the cost and opened the door to even greater popularity. Small local pasta-makers kept pasta production a cottage industry into the early 1900s.

You'd think they were the Italian immigrants who introduced pasta into North America. Surprisingly, it was Thomas Jefferson who, thoroughly impressed, brought a spaghetti die back with him from a visit to Italy in 1786.

TASTINGS Pasta in Central Europe

In Central Europe pasta-makers didn't mass produce pasta until recently. Pasta was cheap, good and popular but Central Europeans ate it in a small number of varieties, and less habitually than Italians. There were regular women pasta-makers who went from household to households making an annual round to prepare a yearly supply of pasta stock. The pasta-maker only requested flour, eggs and plenty of clear space. She arrived to the house early morning laden with her many strange tools and enormous wooden bowls, occupied a room or the basement for a day and produced enough pasta to last a full year for the family. People reserved her weeks or months in advance.

She mixed and hand-kneaded the dough in several of the wooden bowls, each about a meter (three feet) in diameter. Then she rolled the dough out very thin on flour-dusted table-top with a huge rolling pin and folded it over several times. From the dough she cut the many shapes from wide egg noodles to fettuccine with a knife. To produce the rice-shaped orzo pasta, for example, she rubbed the dough through a coarse steel-meshed sieve. When she used up all the dough for whatever shapes the housewife ordered, she spread the products on clean sheets to dry, covering every available flat surface in the house, while she hung long pasta on wooden laundry racks. Depending on the weather, it took the freshly-made pasta 1 to 3 days to dry. (The moisture content goes down from 25 to 10 percent). Today a commercial pasta machine can do that full day's work in 4 or 5 minutes.

Today, pasta is in. Not that it wasn't popular in the past, but now it is highlighted and even given center stage in culinary repertoires. That is fortunate for us, cooks because pasta is nutritious, easily to prepare and suitable for many different types of diets. Like bread, you can eat pasta with virtually any type of food, savory or sweet, bitter or sour. With the least of cooking skill, you can prepare a passable or even good pasta dish literally in minutes. Pasta is one of our most versatile and most economical foods.

In the mid-1980s Americans ate on an average 11 pounds (5 kg) of dry pasta a year per person compared the mid-1990s when the rate went up to 19 pounds (8½ kg). That is quite an increase, though nothing compared to Italians' passion for pasta who eat an annual average of 60 pounds (27 kg).

Pasta Facts

Basic ingredients

What made pasta popular and inexpensive on this continent was the introduction of *durum* wheat by the U.S. Department of Agriculture in the early 1900s. This special strain of hard wheat, a grass that is native to the Middle East, is particularly suitable for pasta dough because it has low starch and high protein—two key requirements of flour to produce firm and non-sticking pasta. The major producer of durum wheat is our wheat belt from Montana to Minnesota and adjacent Canadian provinces. California, New Mexico and Texas also produce substantial amounts. North Dakota is the true champion durum wheat producer with some 80 percent of U.S. production. It has the ideal climate, soil and land type for durum wheat.

To make top quality pasta, flour mills grind *semolina* flour from durum wheat. Semolina is the name of the granular, slightly gritty, coarse-milled flour produced from the endosperm or the inside part of durum wheat grains. It resembles cornmeal. *Farina* is another type of granular pasta flour but it is made from hard wheat, not durum wheat. It resembles semolina with slightly lower protein and higher starch. They also use it in pasta, but the results are not as good. Pasta-makers blend farina with the semolina as a compromise between quality and economy.

Good-quality *shaped* pasta (these are short products like macaroni) are made entirely from semolina. They can make long pasta, like spaghetti, fettucine and lasagna, from farina or a mixture of farina and durum wheat. Home pasta-makers are often stuck with standard hard wheat farina because semolina is not readily available at the retail level.

Pasta-makers use a very stiff dough to make pasta, much stiffer than bread dough. For comparison, pasta dough has 25 to 30 percent water content, while bread dough has closer to 40 percent. That is why pasta dough is harder to work by hand.

By U.S. law, egg pasta must contain a minimum of 5.5 percent egg solids, either in the form of whole eggs or egg yolks. Commercial pasta-makers use dehydrated eggs. Even though pasta-makers use very little eggs, the price for egg products is higher. Eggs are a costly part of pasta compared to the very inexpensive wheat.

Durum wheat has a high yellow pigment content *(carotenoid)*, about double that of standard hard wheat. This pigment gives the durum flour a yellowish tinge. While it is undesirable in bread and cake flours, the color is highly prized in pasta. Adding even a little egg to the dough makes it more yellow and richer-looking.

Commercial pasta-makers mix the dough under vacuum to keep it as airless as possible. Air that incorporates in the dough produces a dull-white look—only airless pasta retains its nice yellowish tone. Home-made eggless pasta, even made with semolina flour, are always white because of the incorporated air in the dough. Home cooks never figured out how to work under vacuum.

The shapes of pasta

Pasta-makers use four categories for their products: long (vermicelli, spaghetti), short

(rigatoni, elbow macaroni), specialty (lasagna, manicotti) and egg products. Nowadays we have dozens of different pasta shapes available to us and many more to restaurateurs.

A relatively new marketing gimmick has introduced all kinds of colored pasta products, made by adding either natural color, like concentrated spinach or tomato, or artificial chemical coloring. A couple of particularly unusual are black pasta, colored with squid ink, and brown pasta, made with unsweetened chocolate. These are not for everyday meals. The added coloring agent is in such small amounts that you barely detect any flavor change, but the unusual appearance of colored pasta makes it worth serving it occasionally.

The demand for a fresh look and attractive presentation has increased the choices of available pasta shapes and sizes. Even though trendy recipes call for one or several specific-shaped pasta as ingredient, spaghetti and macaroni are still the most popular. Short-shaped pasta, like shells and alphabets, are often soup ingredients, as are some long products such as broken up vermicelli. Oriental cuisines use long pasta which ranges in thickness from angel hair to spaghetti. The variety of shapes has a practical as well as aesthetic aspect. Some hold certain sauces better than others.

Convention also has much to do with the specific use of different shapes. For instance, a tomato sauce looks good on any long pasta product like spaghetti, spaghettini or fettucini, but appears odd on wide egg noodles or on tiny peppercorn-shaped *acini di pepe,* though the dish should taste exactly the same.

Pasta-makers produce all these different shapes with special dies through which they press the pasta dough. Each shape needs its own die, and each die is custom made at a cost close to $5000. Pasta dies, thick, large metal discs with a number of specially-shaped holes that the raw dough is forced through, are only made by one company in the U.S. They have 313 different-shaped dies in their catalog! That, however, includes similar shapes with a number of slight variation. For instance, there are 11 different smooth elbow macaroni, eight different ridged elbow macaroni and 16 different spaghetti-like products from the thinnest angel hair pasta to an extra fat spaghetti, fat as a Japanese chop stick.

Within the last several years, smaller pasta manufacturers have begun to produce shapes for special occasions or seasons, for instance, red heart-shaped pasta for Valentine's Day, blue star-shaped pasta for Independence Day, green tree shapes for the holiday season. The cost of the dies and the relatively small runs on these special shapes increase the cost considerably for which you pay. These special-shaped pasta are not only appropriate for occasions, but delightful on the plate.

The continual abrading action of the stiff, unwilling pasta dough squeezed through the tiny holes gradually enlarges these holes and smoothes the sharp edges of the distinctive shapes. Then it is time to replace the die. The lining of the die, called die insert, is now made of either teflon or brass. Interestingly enough it makes a difference which one is in the die. Teflon produces a smooth, shiny, very attractive-looking pasta, but because of its smooth surface, the sauce won't adhere to it readily and the pasta tends to clump together. A brass die insert has a rougher surface under the microscope. Pasta shaped with a brass die is not quite as attractive-looking in the package but holds sauces better because of the slightly rougher surface, and the strands don't clump together. Don’t bother trying to figure out which type you have on your shelf.

Good pasta or not-so-good pasta

Contrary to what a number of cookbooks and cooking teachers claim, an expensive, specialty Italian imported pasta is not a prerequisite to a good pasta dish. Commercial research, as well as tests in my own kitchen, shows that virtually any pasta, except for the very cheapest and obviously poor quality, remain firm when you properly prepare it. So does the higher-priced pasta taste better? No. Why do you need a pasta that tastes good anyway? In almost any pasta dish, it is the topping, or what you mix it with, that supplies the flavor. Pasta's role is to furnish a firm but neutral base. It should not become mushy, and it must not stick to its neighbors. That is all a cook requires of pasta.

Large commercial manufacturers use semolina flour and water to make pasta. When it is a semolina pasta, it doesn't matter whether it is an Italian import in fancy packages, a locally-made pasta from a small manufacturer, or a pasta of one of the giant pasta-makers that distribute all over the continent. Each should taste and cook into a virtually identical product. One of the major source of flour for Italian pasta-makers is U.S. and Canadian durum wheat. Cheaper, poorer quality pasta has a combination of semolina and less expensive hard wheat flour (farina). If they use too little semolina, your pasta is mushy no matter how carefully you cook it. The higher starch content of the hard flour makes it stickier, too. Since Italians use our own durum wheat and they don’t know pasta-making any better than we do, why would the Italian imports be better than our own?

In my own blind taste testing I cooked four different types of pasta: fresh pasta, a costly Italian import, a fairly pricey domestic and an inexpensive store brand. I cooked each according to packaging directions, then offered, unadorned and labeled only with numbers, to a group of tasters. The difference in taste and firmness among the four pasta was not significant. My suggestion is to buy relatively inexpensive pasta and spend generously on the sauce ingredients. (Consumer Reports' test kitchen came to the same conclusion in its 1992 testing.)

Toasted orzo pasta

The fashionable orzo pasta is shaped like rice grains and has about the same size. But it comes in varieties ranging from a quarter of a rice grain to size of a grape. Cooked orzo looks like cooked rice but tastes like pasta. It's a great carbohydrate side dish that goes well with any sauce-rich food. If there is no sauce, butter or olive oil are good choice to moisten orzo. You may cook this pasta in salted boiling water, like an other pasta but in this recipes you toast the grains first to develop an extra flavor layer, then add measured amount of salted water that the pasta absorbs by the end of cooking. The paprika in the recipe adds both color and flavor.

Ingredients
8 ounces (225 g) orzo
1 tablespoon vegetable oil-butter mixture
1 teaspoon paprika
¾ teaspoon salt
1 2/3 cups water

Procedure

1. Heat a large sauté pan with the oil and butter, add orzo and toast over medium heat with continuous stirring until the pasta begins to color lightly, 5 to 7 minutes. Stir in paprika and

continue to sauté for one minute.

2. Add water and salt, bring to boil, reduce heat to low, cover pan and cook for 7 minutes or until all water is absorbed and the orzo is *al dente* in consistency.

Serves 4 as a side dish.

Cooking makes a difference

Cooking pasta is very easy. So why is it that so many cooks ruin it? The fault is usually the cook's inattention or his or her poor knowledge of a few basic facts. Pasta needs plenty of boiling salted water, about three times the volume of the dry pasta. A large amount of water keeps boiling while you add the pasta, a crucial factor for ending up with a firm outcome. If the cook starts with a small pot of water, according to basic laws of physics, the water temperature drops drastically when you drop in the pasta compared to a large pot of water. To help keep water remain in furious boil, add pasta little at a time, not all at once. Start your timer when the last batch is in the water.

Use 1 tablespoon salt for every gallon of cooking water. Cooking without salt gives you a flat-tasting pasta that no sauce can cover up. Too much salt gives a sharp over-salted taste to whatever you mix it with.

Many cookbooks advise you to add oil to the boiling water to keep the pasta from sticking together. This is an unfounded myth. The oil remains on the surface of the water, only making it harder to wash the pot when cleaning up. Pasta won't stick together if you keep stirring for a few seconds while adding it to the boiling water. After the water returns to a full boil, hang around and give your pot a stir once or twice. Good pasta will remain in distinct pieces. Never, never cover the pot while cooking pasta. Some of the starch dissolves in the water during cooking, floats on the surface and the water boils over, making a terrible mess of your stove.

Instructions on the package give you a general guide about cooking time, but experience with the same brand is your best bet. When uncertain about cooking time, taste test the pasta near the end to avoid overcooking. Pasta should be cooked to a stage of, as the Italians say, *al dente*, or firm to the teeth. Fully cooked yet just slightly chewy, like barley grains in a soup.

If you overcook pasta and it becomes mushy, throw it out and start with a brand new batch. Feed the overcooked pasta to your dog. The cat is apt to have more gourmet sense and won't touch it.

As soon as the pasta is cooked, drain it in a colander. Good pasta does not need rinsing. Cheaper pasta with its higher starch may benefit as you remove any remaining surface starch that helps to keep the individual pieces from sticking together. If you serve the pasta right away, shake the colander to remove as much water as possible. Add a little oil, preferably olive oil, to the still-warm cooking pot, just enough to barely cover the bottom. Return the drained pasta to the pot, thoroughly stir the oil into it and warm it over low heat stirring constantly until most of the moisture has evaporated. Now the oil coats the surface of the pasta and keeps the gelatinized starch of neighboring noodles from sticking together. Within a minute your pasta should be hot enough to serve.

When you are baking a pasta dish like lasagna, which has plenty of liquid in the sauce, you don't need to pre-cook the pasta. Disregard all such recipe instruction. Just layer the dry pasta with the rest of the ingredients and bake it for the usual time. By the time it is baked, the pasta will be soft and fully cooked. Try this method first with the family, before you serve it to

dinner guests, to prove to yourself that it works. It saves an hour of anxiety should you try it on guests.

How do you decide how much pasta to cook? There are a number of kitchen gizmos available to help you measure the appropriate amount. Best and easiest is to weigh it. The average person eats about 3 ounces (85 g) of pasta by dry weight when it is the main entrée. Reduce that to 2 to 2½ ounces (55 to 70 g) when it is a side dish with generous amount of other foods. Take into account the individual appetites of the people you are serving, too.

Storage

The shelf life of pasta is virtually unlimited. High humidity or pests are the only things that can ruin it. If a larger package saves you money and you have storage space, buy the large package, even several years' supply. Keep half a dozen different shapes available on your shelf for variety.

Fresh, undried pasta, on the other hand, has an uncomfortably short shelf life. Most cookbooks suggest keeping it in your refrigerator for no more than 2 days. That is probably overly conservative. A fresh chilled dough should keep well for many days, even a week. It will slowly turn green with mold, which probably won't kill you, but it looks disgusting and signals emptying the container into the garbage.

You can store cooked pasta for future use, either in the refrigerator or freezer. How do you reheat it? Start with a pot of boiling salted water, immerse the pasta, stir for 30 seconds, drain and serve. Even better, lower the pasta into the boiling water in a sieve or colander, then remove it in 30 seconds and serve. Very fast, very efficient, and perfectly good, they way restaurant cooks serve pasta. It pays to have cooked pasta in your refrigerator or freezer when time allows you no choice but quick dinner. Use your imagination for toppings.

You can use a microwave oven to reheat stored pasta, too. These ovens vary so much that a standard time and method are hard to suggest. Learn the method that works in your microwave.

Still more pasta

We should not leave some of pasta's close relatives unmentioned, even though they are relatively unimportant when it comes to North American menu items.

The overwhelming variety of strange-named Asian noodles intimidates most Western cooks who, until now, entirely disregarded them. But Asian noodles are "in" and we can no longer ignore them. Even mainline supermarkets carry some of them, and one, *ramen* noodles became household name. Ramen soup packages are highly popular, inexpensive and most convenient, almost instant, reasonably flavorful soups that appear on many people's pantry shelf.

Most Asian noodles are no different from our pasta products. They are usually long products made with wheat flour and there is absolutely no reason why you could not substitute similar-shaped pasta for them. Oriental egg noodles are similar to Italian angel hair pasta, vermicelli or spaghettini (these are all long but increasingly thicker pasta) but the Oriental version includes a small amount of egg. For example, you can use vermicelli or angel hair pasta when the recipe calls for thin Chinese noodles or ramen noodles. The Japanese make similar noodles from buckwheat flour, giving a heavy, dark-hued pasta. Some Oriental cuisines even make noodles from mung bean flour. There is no substitute for these types in the Italian pasta repertoire.

Rice flour is the ingredient for rice noodles. They have different texture, color, appearance and mouthfeel than wheat flour noodles of the same shape but if you are stuck in a recipe, go ahead, substitute with vermicelli weight by weight. You can also use a more commonly available Asian noodles for some odd-named variety a recipe calls for, just like you can substitute one Italian pasta for another in most recipes. The result may not be authentic but the dish will taste the same.

Spätzle is a somewhat more distant cousin, mostly in German and Eastern European cooking (it is called *galuska* in Hungary and *kluski* in Poland). *Spätzle* is really a fresh, homemade irregular-shaped egg pasta, the size of cherries, that look like tiny dumplings. Its blessings is in its quick preparation yet it also tastes good with a slightly chewy consistency of *al dente* macaroni. *Spätzle* is so rough and irregular in shape, that it holds sauces very effectively like many tiny little spoons.

With a little experience you can put *spätzle* on the table in less than 10 minutes. Put the pot of water on to heat and mix the flour, water and egg into a medium-stiff dough, something like a soft yeast bread dough. Form it into small chunks and drop into the boiling water. It is ready three minutes later. Drain and serve.

Experienced cooks can make *spätzle* with nothing but a small board and a spoon with which they scrape little pieces of dough into the boiling water. But if you are making more than 6 or 8 servings, a *spätzle*-maker is handy. I came across two kinds. One is a flat, rectangular-shaped metal tool with large holes that looks like a flat grater. It has hooks to hold it firmly on top of a pot. You place some of the dough on top of it while it sits over the boiling water, and scrape it back and forth with a spoon until you press the dough through the holes, then continue with the rest of the dough. The second type is a food-mill-like tool with a handle that rotates a paddle on the bottom. The paddle presses the dough through holes into the boiling water. This also has hooks to firmly set it over a pot of boiling water. Both are efficient, easy to use.

Italian *gnocchi* is similar to *spätzle* but you make it with semolina instead of standard household flour. Italians, who like variations on a theme, add other ingredients besides the flour to cook cornmeal *gnocchi*, potato *gnocchi*, ricotta *gnocchi* to name a few.

RICE

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Food fads are strange, unpredictable social phenomena that influence restaurant menus, supermarket shelves, farmers' growing plans and our own cooking. Pasta, that wonderful, highly versatile, good-tasting and inexpensive side dish took off on a meteoric rise that carried it to the top of the "in" food list in North America. Why not rice? It is just as versatile, just as tasty, also nutritious and inexpensive, and lends itself to any course on the menu—just as suitable for appetizers and salads as for desserts. You can permeate it with any flavor or spoon any kind of sauce over it with equally good results.

Is it because Italian cuisine has been a favorite international food for generations? Is it because pasta is easier to present on a plate, or it holds better once cooked? Which is always a consideration for restaurant and catering chefs. Or is it simply that many chefs lack the experience of cooking rice to perfection? The French admit it in their bible, *LaRousse Gastronomique*, that rice cooking is one of their weaknesses—in fact rice is an uncommon item on French dinner tables.

I think the main reason for rice's third placement in North American kitchens (also taking a back seat to the all-American potato) is the ease cooks can ruin it. Latitude for error in rice cooking is small; pasta is not nearly so vulnerable. The trend of adding a rice cooker to standard kitchen equipment may increase rice's popularity in American kitchens. A rice cooker offers a foolproof routine to consistently present perfect rice. Rice cooker may be great, but the only equipment a good cook needs to cook the perfect rice is a pot with a lid.

Rice Facts

How it all began

Archeologists traced rice cultivation back to long before Arabs or Chinese invented pasta. Findings from a Thai excavation pointed to rice cultivation dating back to 5500 years ago. Recently, however, archeologists found an even older rice-growing area at a Chinese site which existed 1500 years before the Thai site. The first confirmed pasta making was much later, about 2500 years ago, interestingly, also in China (see pasta history, under Pasta).

Some believe that the rice plant originated in China, others that it started in Northern India around the Himalayan foothills. It may have been native in both places. Explorers brought rice to Europe about 2300 years ago, though it was much later, in the 900s, that Spanish growers first cultivated it.

Rice was one of the first crops in the early days of North American agriculture with the first commercial production on the wetlands near Charleston, South Carolina, in 1694. By the 1700s, this region produced more rice than available cargo ships could handle to transport it to England. The next major step in rice production was in 1884, an attempt by an Iowa farmer to grow it on the higher and drier prairie lands of Louisiana and Texas. These areas allowed the use of heavy equipment for planting, growing and harvesting. Such mechanization was not possible on the original marshy lands of South Carolina.

Rice farming spread throughout the southeastern states in the next two centuries and skipped to California in 1912. Rice loved California and the state is now one of the best and highest yielding rice-growing regions in the world, producing superb rice. Even the Japanese, who are extremely particular about their rice, accept California rice as equal to their own.

Rice is the second largest crop worldwide, topped only by wheat. Without rice, most of Asians don't consider a meal a meal—in places they eat it three times a day, 365 days a year. They also treat it with as great reverence there as we do bread in the western hemisphere. Many ceremonies feature rice, including one we have adopted, throwing of rice at newlyweds. Rice is an ancient fertility symbol—with the toss of a handful we wish the happy couple numerous children. Although the concept is dated, the ritual remained.

Ideal natural conditions for rice growing are hot growing seasons and low-lying, marshy lands that the tides flood twice a day as they force fresh-water rivers back from the ocean. These lands are perfect for rice—very fertile from the annual nutrient-rich spring floods.

Regular flooding of rice fields away from its natural habitat imitate that condition, though not with the twice-a-day clockwork schedule of tides.

Types of rice

Rice is a common cereal plant that belongs to the Genus *Oryza*. Within this genus there are 25 species, but we only cultivate one throughout the world. (There is a second species Africans grow locally.)

Rice has a truly amazing number of varieties, estimated in number from 2500 to 100,000, (depending on the authority quoting it) that growers bred from the original wild rice grass. Commercially, there is one simple distinction among all the great varieties of rice: long-grain (or Indian) rice and short-grain (or Japanese) rice.

At the kitchen level we have several types of popular types of rice, each serving a specific purpose. We have brown rice, polished white rice, converted (or parboiled) rice, instant rice and glutinous rice. Basmati and jasmine rice have become trendy items that now appear in most well-stocked pantries, too. Asia, of course, offers many more choices. Every household stocks at least three types of rice: a white polished rice for the family table, an unpolished, lower-priced brown rice for the servants and an inexpensive, low-quality rice for the dogs and other pets.

What makes the difference

It is the milling process that gives us the different types of rice. The first step is to remove the hull, the tough outside cover that protects and holds the grain together. What is left are the rice grains which we know as brown rice. It is brown because a thin bran layer still covers each individual grain, like the skin on a grape.

To produce white rice, the grains go through an abrading process that removes the thin bran covering, as well as the rice germ that sits at one end of each grain. Both the bran layer and the germ contain a small amount of stored fat that turns rancid on storage. Removing both gives us unpolished white rice which still has another thin outer layer with a small amount of fat. The next process is to put the unpolished rice through a machine where stiff wire brushes remove that thin outer layer from the grain. This step yields a high polish for improved appearance, which is the basis for the name polished rice. Since now all fat has been removed, polished rice has a virtually indefinite storage life and is the preferred rice throughout the world, partly because of tradition and partly because of its attractive appearance. One hundred pounds (or 100 kg) of brown rice yields 91 pounds (or 91 kg) of polished white rice. The 9 pounds (1 kg) lost is the bran, the germ and the thin fatty layer surrounding the grain.

Nutritionally the polishing is unfortunate because it removes the most valuable part of the grain. People on polished white rice diets become ill and may die of malnutrition. Feeding them the bran of the rice or some other form of vitamin B_1 that the bran contains, restores them into full health.

Rice for non-cooks

What about converted and instant rice?

To make converted (also called parboiled rice), the processors uses steam or boiling water over brown rice for a brief period before the milling process. This gelatinizes the starch in the rice grain. Then they dry and mill the rice the usual way as for white rice, ending in polished converted white rice.

Converted rice is more nutritious than polished white rice and was developed for people who rely on rice as a staple diet. This is because gelatinizing the thin outer layer of the rice makes some of the vitamin B complex adhere to the grain itself instead of to the bran, keeping more of it intact during polishing. International organizations introduced converted rice successfully to Africa and the West Indies, but people of Southeast Asia and the Philippines flatly rejected it. Since the standard diet in the Western Hemisphere is much more varied and people don't usually rely on just one or two foods as staples, the use of the more nutritious converted rice is not so critical in North America. It has a long storage life because the heat in the parboiling process inactivates the enzyme that plays part in turning the rice rancid. Converted rice takes longer to cook than regular rice and has a pasty, somewhat sticky texture.

Then there is quick or instant rice (we know it by its household brand name, Minute Rice) for those who absolutely refuse to cook rice. Most of us cooks started off with instant rice and some stayed with it.

To produce quick rice, processors soaks the milled grains, then cook them until they are almost completely soft. Then they cool, freeze, thaw and finally dehydrate it. This gives a product that timid cooks can reconstitute in hot water, and place it on the table in five minutes. Its convenience is its only attribute. The relative cost is high, and its flavor and consistency don't compare well with regular white rice.

The most common rice varieties

Long and short-grain rice are two of the most commonly used varieties. The names describe the shape of the grains—long-grain rice is long and skinny while short-grain rice is short and fat. But there's another major difference between these two varieties. Short-grain rice contains much more of the starch, that makes the grains stickier, allowing them to clump together. Long-grain rice, with significantly less starch, cooks into drier, non-sticking grains.

Two kinds of starch are a major constituent in any rice: *amylopectin* and *amylose*. If you want to cook good rice, you need to know the relative amounts of each in the kind you are using. It determines the texture and feel of the cooked rice on your plate. The higher the relative amylopectin content of the rice, the stickier and more clinging the grains are. If you eat with chopsticks, a sticky rice with high amylopectin content is what you want so a good-size clump stays on the chopsticks.

Pakistanis, Indians and other nearby nations eat with their fingers, so the stickiness of rice is not important to them. They prefer the low-amylopectin long-grain rice that cooks into

separate non-clinging grains. Western cuisines also prefer long-grain rice, probably because it is aesthetically more appealing. Having forks as eating utensils make either type convenient to eat.

Glutinous rice, also called sweet or sticky rice, is not very familiar to North Americans. This high-starch variety of rice is a staple in some parts of Asia, but other cooks also use it in some preparations such as rice desserts, Japanese sushi and leaf-wrapped rice concoctions where the high starch content and sticky quality are helpful in the preparation.

Food processors use glutinous rice in many commercial products as a binder in frozen gravies, sauces and fillings in the form of rice starch and rice flour. Both are ideal for this purpose because they resist breakdown in freezing and thawing, unlike starches derived from other sources.

Aromatic rice, as the name implies, has a relatively high aromatic compound content that gives off a detectable pleasing scent while cooking, some of which remains in the cooked rice as a faint flavor. All rices include aromatic compounds in their complex chemical make-ups but aromatic rice is especially high. Jasmine rice and basmati rice are the most popular of these aromatic rices. Jasmine rice came originally from Thailand, but now U.S. rice farmers also grow it. In late 1990s only Thailand and U.S. grew jasmine rice. Its price is quite reasonable, and it is readily available in Asian markets, even in some supermarkets, in North America.

Basmati rice has become a trendy item during the 1990s. Because it only grows in a few regions of India and Pakistan, demand exceeds supply and its price is relatively high. It has long, slender grains and a pleasant, aromatic flavor that is unequalled by any other white rice. The grains have the curious property of swelling mainly in the long direction of the grain during cooking. This produces long, thin, pretty and elegant cooked rice.

Even though aromatic compounds barely affect flavor, our olfactory organs are so closely tied to our taste buds, the pleasant aroma gives an additional tasting pleasure sensation. This is true only when the food you serve with rice has a subtle flavor. If you serve an intensely-flavored, strongly-scented spicy food over rice, like a South Indian curry or a Mexican piquant *mole*, the spices completely overpower the more delicate aromatics of the rice. For such dishes you might as well use a good plain rice.

TASTINGS Comparing rice nutrition

Vitamin B in rice

(in microgram per gram of rice)

	Brown	**Converted**	**Polished**
Thiamine (vitamin B_1)	3.69	2.57	0.60
Riboflavin (vitamin B_2)	0.50	0.36	0.25
Niacin (vitamin B_3)	53.8	39.8	18.1

Cooking techniques

A few failures can intimidate anyone, yet cooking rice to perfection, once you learn it, is one of the easiest and most fool-proof kitchen tasks, next to boiling water. Remember one thing—rice cooking leaves very little latitude for errors or carelessness. Learn a good rice cooking technique, practice it and stick with it (pun unintended). You'll invariably end up with fluffy, perfectly-cooked rice grains that are neither dry nor soggy or sticky. And if it is sticky rice you are after, you will get the stickiest, gummiest rice that stays on your chopsticks in good-size

lumps instead of two or three grains at a time.

Have a rice-cooking marathon to get thoroughly familiar with the technique. Get a pound or two (a kilo) of rice and play hooky from work for a couple of hours. Start with the recipe here, then vary your technique to suit your taste until you judge the finished product perfect for your taste and your purposes. Rice cooking varies slightly depending on your water, variety of rice, humidity (i.e. how much moisture rice grains retain) and how hot your lowest burner setting is. And some people like rice slightly *al dente*, others soft. Keep cooking batches of rice until you have exactly the way you like it, noting for each batch the amount of water you used and cooking time. It is a very cheap lesson, since rice is so inexpensive, and it only takes a few hours. Feed your dog or cat any poor results and tell them that all Asian pets live mainly on rice. They don't know the difference between good and bad rice and it is good for them (many canned cat and dog food filler is rice).

Each cookbook's rice cooking technique is different. One variable, the amount of water to use so the rice absorbs the last drop at the end of the cooking period, changes with the age of the rice. Younger rice has a higher moisture content, so use slightly less water. But virtually all rice we buy has passed the young-rice stage.

The large variety of cooking techniques probably originated in Asia. There are many Asian rice-eating nations, and each culture prefers a different end result. Many people in parts of Asia prefer a long-grain, fluffy, dry rice. But even these people don't agree on their cooking techniques. In Pakistan, India, Burma and Sri Lanka they cook rice with salt. In Malaysia, Thailand, Indonesia and Vietnam they cook it without salt. Going further east, Cambodia, Korea, China and Japan prefer a medium or short-grain variety that cooks up fluffy but moist with the grains sticking together. They add no salt to the water. In Laos, they eat glutinous rice as the everyday staple, not just in sweet preparations.

In Western cookbooks, the recommended cooking time for white rice varies from 15 to 30 minutes. Your guess is as good as anyone's why this broad range.

Another area of complete disagreement is whether to rinse the rice before cooking. Asians often do this simply because their rice is not pre-cleaned. With better processing techniques clean rice is now available more readily in Asia. Rice we buy in the U.S. is always clean and you save a step by not rinsing it before cooking.

Another argument for pre-rinsers is to remove any surface starch that would make the cooked rice sticky. Rinsing advocates swear that rinsing until the water runs clear (starch in the rinsing water turns it milky) gives the fluffiest, driest, least sticky grains possible. Non-rinsers argue that rinsing washes away most of the nutrients, particularly the three B vitamins. Nutritional researchers agree. Laboratory experiments confirmed that much of the valuable vitamins end up in the rinse water with extensive rinsing. So do you want vitamin-rich rice or non-sticky rice?

To settle the controversy, I cooked identical rice in identical pots, one after a thorough rinse and one straight from the bin. I found no perceivable difference in stickiness or in any other culinary properties between the two pots of cooked rice. My recommendation—don't rinse the vitamins away and save an unnecessary step.

There are three different ways to cook rice in your kitchen (not including the rice cooker). One way is to cook it like pasta, in plenty of boiling salted water. When it is cooked, pour water and rice into a colander, drain well and serve. This is not the easiest, and much of the nutrients in the rice end up in the cooking water. But the method is foolproof.

Then you can cook rice in the oven. Combine rice, measured water and salt, and bake,

tightly covered, in a 350°F (180°C) oven for 25 to 30 minutes (if you are using brown rice, give it an hour). Uncover and let bake for a few more minutes to evaporate any residual moisture. Simple.

The best and easiest method is the absorption (some cooks call it steaming) method. Put unrinsed rice into measured boiling salted water, cover, turn the heat low and cook for 15 minutes. Then let the pot sit covered, off the heat for 5 minutes. The proportions are 1 cup rice, 1½ cups water and ½ teaspoon salt. Fluff gently with two forks and the rice is ready to eat. This amount serves four people.

If you are cooking more than one cup of raw long-grain rice, for each *additional* cup of rice you only add 1¼ cups of water, not 1½. The amount of salt remains ½ teaspoon for every cup of rice. For short-grain rice the cooking technique and amount of water is the same, but for each *additional* cup of rice add only 1 cup of water.

Brown rice takes longer to cook because of the fibrous bran layer that cover the grains needs longer time to soften. The amount of water and salt are the same as for long-grain rice. Most brown rice cooks in 40 minutes.

Glutinous rice is not cooked in water but steamed. I don't know the reason, possible it is tradition. The less common Asian variety, black glutinous rice, on the other hand, they always cook in water.

Both the absorption method and oven cooking rice, by the way, retain all nutrients.

Storing rice

Any type of white rice keeps indefinitely in storage as long as humidity is not high and it is in a tightly closed container to keep pests out. So if you use rice regularly, you like a brand and you have enough storage facility, don't hesitate to buy it in large quantity, like in a 25-pound bag.

Brown rice has a far shorter life because it still has its bran and endosperm. It is the oil in both bran and endosperm that slowly turns rancid (oxidizes) spoiling the flavor. During the hot season, or if you live in a hot climate, store brown rice in the refrigerator to slow oxidation or buy it in small quantities. You will not notice any deterioration in flavor for at least a year if refrigerated but on your pantry shelf six months is the longest recommended storage under normal conditions.

More rice cooking tips

• Indian cooks in Asia always soak basmati rice before cooking. Basmati rice is fragile and soaking swells the rice grain. The softened, soaked grain is less likely to break apart during cooking. This is a good advice that western cooks should also follow.

• Some cooks add flavoring to the rice cooking water. If they plan to serve it with seafood, they may cook it in clam juice with a little lemon juice or soy sauce. For Mexican or Spanish rice, they may substitute tomato or vegetable juice for water. For meat dishes the liquid may be beef bouillon or stock. Spices and herbs in the cooking water give rice a distinctive flavor and may also add a beautiful color. Our favorites are garlic, onion, paprika, curry powder and turmeric. But if the entrée comes with plenty of flavorful sauce to spoon over the rice, it needs nothing more than plain salted cooking water.

• For a pleasant, nutty flavor some cooks toast raw rice in the cooking pot over moderate heat either dry or with a little oil before adding the water. If you do that, stir constantly to

prevent scorching and bitter taste. Toasting for 3 to 5 minutes should do.

• When cooked rice cools, it hardens. The long amylose starch molecules on cooling form a somewhat orderly structure from the random mess they are in when still hot. Because of this partial order, the molecules hold on to each other more firmly and the rice grains stiffen. So what does that mean to cooks? If you need to add ingredients to rice that you plan to serve cold, add those while the rice is still warm and soft. Once the grains stiffen, it is harder to uniformly stir in ingredients, and you disrupt the orderly rice grains.

• If you have very hard water, you may not be able to keep your rice snow-white. Acidify your cooking water with one teaspoon vinegar for every cup of raw rice you use, and your rice remains pure white.

• Extra cooked rice keeps well in the refrigerator for several days and at least six months in the freezer. If you have the storage space, plan to cook extra. Here are several good ways to reheat leftover rice: steam in a steamer for a few minutes; cook slowly for 4 to 5 minutes in a pot with 2 tablespoons of water for every cup of rice; heat covered on high in the microwave, one minute for every cup of rice. You may reheat frozen rice the same way, but allow a little extra time.

WILD RICE

Wild rice, a distant cousin of rice, has a flavor, in many gourmets' opinion, that equals or surpasses the best basmati rice. Yet, it is sadly neglected on menus. The reason may be tradition as well as its higher price. In the past, food packagers blended wild rice with white or brown rice for appeal and to round out flavors, particularly in stuffing. Wild rice appeared sparingly in these blends, not much more than embellishment. The reason was price which, up the 1990s, was rather high. A package of pure wild rice most often ended up on pantry shelves when received as a lavish gift and, cooks measured it out by tablespoons instead of cups. In the past a pound (half a kilo) of wild rice cost as much as a pound (half a kilo) of best beef tenderloin, rather costly for a weekday side dish.

With the introduction of large-scale commercial wild rice growing in the U.S. in the early 1990s, the price dropped drastically to half or third until it became quite affordable. Perhaps today's cooks still consider wild rice a luxury food, or it simply has not been "discovered" yet, but its use in mainstream cooking is minimal. In such cuisines as Oriental and Indian, centuries of tradition ingrained white rice as the only rice acceptable. The wild rice industry has engaged slick marketing techniques to rock this tradition and persuade people to add a little of their product to the daily pot of rice, but without success. Asian, African and Latin American rice eaters simply will not consider it. They don’t think wild rice is rice. And in that, they are correct.

Where it comes from

Wild rice is an aquatic fresh-water grass native to the Great Lakes region of North America. It gradually and naturally spread to the Northeastern U.S. and Eastern Canada along fresh-waterways. There are four slightly different wild rice species that all belong to the genus *Zizania*.

Native American Indians harvested wild rice for over 1000 years using a simple technique of paddling into areas with naturally growth, bending the grain-rich ripe grass stems

over their canoes and flailing them with sticks to release the grass seeds into the bottom of the boat. When the canoe was nearly full, they paddled to the shore and roasted the seeds over low fire, pounded to release the hulls and stored the rice for winter food.

The earliest wild rice dealers were fur traders in Minnesota, Ontario and Saskatchewan who found that the wild rice added a wonderful new experience to a meal. Some of the fur traders eventually became wild rice growers in Minnesota. They did their own selective breeding of seeds from each new crop choosing the healthiest plants with highest yield, and developed progressively better wild rice, also getting some help from the University of Minnesota researchers.

How we grow wild rice

In the mid-1970s rice growers introduced wild rice into California's rice-growing region in the Sacramento Valley and attempts to grow proved highly successful. Because of its high price, fifty-some growers quickly switched from regular to wild rice crops and within years they devoted large acreages to wild rice. While they systematically flooded their rice fields, they also quickly flooded the still weak wild rice market, and the price plummeted. In the following few years many farmers converted wild rice fields back to their mundane white rice.

The switch from growing white to wild rice is an easy one. They both take the same field conditions, harvesting methods and equipment with minor changes here and there. The farmers cannot use herbicides to kill weeds growing with wild rice. Any chemical that destroys the weeds also destroy the wild rice. Carefully regulating water depths at different stages of rice plant development is the only way to eliminate most of the weeds without chemicals.

To sow the wild rice, modern California farmers hire aircrafts that scatter seeds from the air into flooded fields. After 80 days they drain the fields and when the seeds reach full maturity, they harvest the rice with conventional combines. In Minnesota, Ontario and Saskatchewan commercial production is still a lot more primitive because they use natural waterways instead of large open fields like in California, making large-scale mechanization problematic. Their yield of wild rice per acre is only a quarter of California's.

Wild rice can grow in much cooler weather than white rice so in California farmers can plant it any time of the year. In cool weather it matures in about 170 days instead of the usual 100 to 105 days for white rice.

Another peculiarity of wild rice is the dormancy of the seeds. In natural conditions in the Great Lakes region, the mature seeds drop into the water, sink to the bottom and remain dormant in cold water until the next growing season. California growers discovered that without this dormancy period in cold water, seeds don't germinate well. So they store the seeds for next year's crop in 35°F (2°C) water for at least 5 months to make them think they are on the bottom of a Minnesota lake.

Unlike other forms of rice, the wild plants don't all mature at the same time, a huge problem for harvesters. This unusual property of wild rice is called *shattering*. Agronomists developed new cultivated varieties (called *cultivars*) that are resistant to shattering and tend to mature close to the same time. They selected these cultivars for earlier maturity as well.

Between harvest and the package

The harvested rice is called green rice, but the name refers to their young stage, not to

their color. Wild rice is shiny, glistening, burnished black that very few natural foods can match in beauty. The color is not uniform because of the different degrees of maturity among the seeds. Farmers use a four to ten-day period of curing, sometimes called fermentation period, that allows the less mature grains to catch up. In the Great Lakes region growers do this outdoors, while they periodically sprinkle the grains with water. California growers use the indoors under more controlled conditions. During curing an enzyme in the grains degrades whatever chlorophyll still remains and changes the green pigments to black. Microflora that exist in the curing process start flavor development which is the reason they use the term fermentation for the process. The flavor further develops during the later roasting stage.

While the hulls still cover the grains, processors may soak the rice in hot water for 3 hours. They call this parboiling, although in a strict culinary sense it is not—it is simply soaking. The hot water gelatinizes the starch granules in the rice grains, giving the rice a glossy, translucent look. Parboiling serves several purposes: it improves the appearance, it allows a shorter cooking time in the kitchen and it limits breakage of grains in the final processing steps. Its drawback is the it adds to the cost. Large commercial wild rice users specify if they are willing to pay for this extra step with its added extra cost before they contract with the wild rice farmer.

The next step, roasting, is also at the discretion of the food processors. Again, it adds to the cost, but roasting intensifies the characteristic nutty flavor and reduces moisture content to about 7 percent from the original 35 to 50 percent. The roaster places the rice in huge rotary drum dryers and roasts at 275°F (135°C) for 2 hours.

Next they remove the hulls. They pass the rice through closely-spaced rollers covered by rubber-like material. Processors once more have two choices for this step. If they use smooth rollers, the results are shiny, black attractive grains that require longer cooking time. If they use rougher rollers, the rollers break or partly remove the outer bran layer of each grain, producing duller-looking grains that take less time to cook. When cooking this type of rice the hot water has readier access to the grains—the reason for the shorter cooking time which is cut by about half. These *scarified* grains, as processors call them, also have fewer nutrients because part of the nutrient-rich bran layer is gone.

Food processors use most wild rice in various rice blends, soups and stuffing mixes. Scarifying the wild rice to reduce cooking time makes sense as the wild rice should cook in about the same length of time as the ingredients it is blended with. You sacrifice the beauty of the shiny black grains and some of the nutrients. Pretty grains are unimportant—their good looks get lost in the mixture.

Retail packages don't indicate whether the wild rice you buy was parboiled or roasted, but the price will. Each process is an extra step and adds to the cost. Designated cooking time may also tell you this. If the package instructs you to cook for 20 to 25 minutes, you have parboiled rice. If it says 40 to 50 minutes, the grains are raw. When you buy pure unblended wild rice, it is never scarified—each individual grain must be shiny, black and unbroken. Generally only food processors use scarified wild rice.

How to cook wild rice

Use the same technique for cooking wild rice as you would for brown or white rice but add more water. About 1½ cups of water and ½ teaspoon salt to every cup of wild rice is the recommended amount for most, and use 1¼ cups of water for each additional cup of wild rice.

Cooking time varies, of course. Start with the package directions which tend to give too long a time. Test the grains about 5 minutes before the recommended cooking time is up. They should still be a little firm and chewy, not mushy. As soon as the grains open (culinary pros call it *butterflying*), the wild rice is done.

In spite of what cookbooks tell you, wild rice needs no pre-soaking or washing. Packaged wild rice is clean. If you are extra particular, rinse the rice quickly in running water so you don't flush the nutrients down the sink. But soaking is completely unnecessary.

Since cooking time for both wild rice and brown rice is about the same, there is no reason why you cannot cook them together. When you want to prepare a blend of wild rice and white rice which have differing cooking times, you need to cook the two separately, then blend together with light hands while still warm.

Wild rice-brown rice salad with orange zest

The cooking time for wild rice and brown rice are about the same so you can conveniently cook them together. But check package directions to be sure. The crisp, nutty flavor and crunch of wild rice blend perfectly with the rich, soft-warm flavor of brown rice. Their contrasting colors with the addition of green scallions, peas and black olives is conducive to beautiful presentation. Besides flavor and good color combination, this salad is also highly nutritious.

Ingredients
2 cups water
½ teaspoon salt
8 ounces (225 g) (1 cup + 2 tablespoons) brown rice
4 ounces (110 g) (13 tablespoons) wild rice
3 ounces (85 g) (½ cup) frozen green peas
1½ ounces (40 g) (¼ cup) black olives, sliced
2 green onions with part of green tops, sliced

Dressing
3 tablespoons olive oil
3 tablespoons red wine vinegar
¾ teaspoon red chili flakes
1 tablespoon fresh-grated orange zest

Procedure

1. (Check cooking directions on packaging. If close to the same for both rices, follow these directions. If not, cook them separately.) Bring water with salt to boil, add unrinsed brown and wild rice and cook covered over low heat for 40 minutes or until both are tender but still with a slight bite. Let rest covered off the heat for 5 minutes.

2. While rice is cooking, prepare dressing. Add oil, vinegar, chili flakes and orange zest into a large salad bowl and combine them vigorously with a wire whisk. Stir in green peas, black olives and scallions.

3. When rice is cooked and rested, add it to the salad bowl while still hot and gently but

thoroughly stir into dressing until well combined. Let salad cool. Best served at room temperature.

Serves 6 to 8. This salad keep well in the refrigerator for 5 to 6 days.

Nutrition of Different Rices

The table below gives the value of three B vitamins, the principal micro-nutrients in rice. The values are in micrograms of the vitamin for every gram of raw rice. The wild rice is part of the table, even though botanically it is not a rice.

Type of Rice	**Thiamine** (Vitamin B_1)	**Riboflavin** (Vitamin B_2)	**Niacin** (Vitamin B_3)
Brown Rice	3.7	0.5	53.8
Converted white rice	2.5	0.4	39.8
White rice	0.6	0.3	18.1
Wild rice	4.5	6.3	62.0

SPUDS AND TATERS

Without the nightshade botanical family, serious cooks would have a tough time surviving. Potato is the most humble and most basic member of this family with a tremendous staying power. Potato was "in" 200 years ago and they are still "in" today. Virtually everyone likes them. Potato is one of the most popular, most important vegetable in the world and undoubtedly the most important root vegetable. The Irish potato famine (1845 to 1849) showed that people can and do live on a diet of little else but potatoes. When a potato blight hit and wiped out their only crop, a million Irish perished of starvation in just a few years.

Through culinary evolutions and revolutions, potatoes remain on the menus of western cultures. One reason is that the potato is hard to ruin. It is forgiving of your cooking errors and ends up edible even if you have the least cooking skill and pay minimal attention. For people who know nothing at all about cooking and detest the kitchen, the food processing industry invented instant potatoes, which are both faster and easier to prepare than the real thing, though its flavor and texture resemble potato's like a horse-and-buggy resembles the automobile.

Potato Facts

Where it came from

The potato has been traced back to South and Central Americas where over 150 species still grow in the wild. The Spanish introduced it to their homeland in the late 1500s, from where it spread slowly to the rest of Western Europe and eventually the whole world. By the time it found its way to North America in the early 1700s, potatoes were all over in Europe as animal feed and as staple food for the poor. Western cuisines prefer potatoes as their carbohydrate starch of choice, unlike the eastern cuisines where rice is king.

A single species of potato, *Solanum tuberosum*, accounts for almost all the world's crop. There are seven other species that are only locally cultivated in Bolivia, Peru, Ecuador and Venezuela.

How potato grows

The edible part of the potato plant is the enlarged tip of an underground stem, called a tuber. In wild plants this enlargement is small, just a swelling of the stem, but cultivation progressively favored plants with larger swellings until they became the size they are today—up to a pound (half a kilo) apiece commonly but even two-pound (a kilo) potatoes are not uncommon—enough to feed a family of six

.

Nutrition

The potato is a very nutritious vegetable and not at all fattening. The fattening part is what you add to it or pile up on top of it—butter, sour cream or the oil that it absorbs while you fry it. It is a good source of carbohydrates (60 to 90 percent of total solids). The carbohydrate is in the form of starch (both *amylose* and *amylopectin*, the same as in rice; see The most common

rice varieties, under Rice).

Potatoes are also a good source of vitamins and trace minerals. Many of these are in the skin or right under it, so you lose them when you peel and throw away the skin. Vitamins B and C are particularly high, although they slowly disappear with long-term storage and overcooking.

Sugar, a mixture of glucose, fructose and sucrose, is also relatively high (0.1 to 0.7 percent). The amount of sugar depends on maturity, length of storage and temperature during storage. Potatoes contain a moderate amount of protein, too. Dietary fiber is high, but again, mainly in the skin.

Whole potatoes (unpeeled) with the skin on have much higher nutritional value than white rice and pasta. Peeled, they have comparable value as those other two starch-rich foods.

All the different kinds

The number of varieties of potatoes cultivated all over the world is huge. What farmers can grown economically, harvest effectively, transport without damage and store for a relatively long time without deterioration dictate the few choices available to consumers in the U.S. and Canada. What consumers are willing to accept also influences farmers' decision. Like everything else on the market, what is available in the produce section of your local grocery store is a series of compromises—not necessarily the best but always available (therefore recognizable), inexpensive and reasonably good.

Mealy or waxy

As cooks, we can appraise potatoes from two points of view—culinary use and appearance. For culinary purposes there are two broad classes. Which one you choose for what culinary purpose determines how the potato looks on your plate:

1. The dry, fluffy, starchy, mealy types which produce the most appealing and tasty baked potatoes. These are also good choices for frying and deep-frying as they absorb less oil. These potatoes tend to fall apart when you boil them.
2. The waxy, moist types with lower starch content that hold up well and firmer when you cook them in water. They are best as boiled and scalloped potatoes or in potato salads. These varieties still taste good baked, but sacrifice the dry fluffy texture.

The kind you happened to have in your pantry dictates how you should prepare them. But don't hesitate to use one kind for a less suitable use, if that is all you have. They just won't be perfect.

If you don't know what specific variety you have, one of these quick tests will tell you whether they are high-starch or low-starch.

1. Cut the potato in half and rub the two cut pieces briskly against each other. If the potato has a lot of starch, you produce plenty of frothy, starchy juice as you rub.
2. Prepare a brine of 1 part salt to 11 parts water and drop a piece of potato in it. High-starch potatoes are denser and sink in the brine. Low-starch potatoes float.

Appearance

U.S. and Canadian commercial growers cultivate about 33 varieties of potatoes, not including a couple of dozen specialty potatoes—8 to 10 of these dominate the market. This

number changes as agronomists introduce newer, more promising varieties and abandon less desirable ones. The names, however, don't mean very much to either cooks or consumers because they are not much in use in the retail produce departments. You are likely to find four types on display:

1. The **russet**, that is also called Idaho potato, no matter where it is grown. Two-thirds of all U.S. potatoes are russets. These are the ideal baking and deep-frying potatoes. Russets are light brown or russet brown in color with a slightly rough, thick skin, a long oval shape and shallow eyes. The flesh is creamy white. Even though these are high-starch frying or baking potatoes, they boil well, too, and do well in salads if you are careful not to overcook them, or all that high starch makes them fall apart.
2. **Red potatoes** became trendy in the 1980s. They have red-colored smooth skins and are round or oval in shape with quite a few deep eyes. They are waxy and have a firm texture. Their low starch content makes them perfect for boiling or sautéing, or in soups, stews or salads. Because of their thin skin and attractive color, your best approach is to use them unpeeled, if peels are acceptable in your preparation.
3. **Round white** potatoes have an ivory or creamy-buff rather than white skin, as the name implies, a thin peel and low starch. These are also waxy and ideal for boiling, but acceptable fried or baked as well.
4. **Long white**, **California long white** and **white rose** are different names for the same variety. California and Arizona grow them commercially. This variety has smooth fawn-colored skin, shallow eyes that are barely visible, a firm texture, low starch content and creamy-white flesh similar to the round whites.

Russets, white and red potatoes are often available year-round in most part of the country if there is local demand for them. Each of these three common types have a number of varieties but you never know what you get since they don't label varieties. Occasionally you may see the name of a particularly common type, like round white katahdin or red Pontiac or russet Burbank.

What about new potatoes? This name doesn't refer to a specific variety, but is applied to any potato that growers pick young (when the plant is still green) and the tubers are immature. Farmers only harvest mature potatoes when the plant dries and turns yellow. New potatoes have a wonderful flavor, thin skin and are relatively perishable, therefore higher priced. New potatoes tend to be small and available only fresh—they don't go in lengthy storage. Distributors specially select and package creamers or baby potatoes for uniformly small size and are pricey. High-end restaurants, clubs and other institutions tend to buy these.

Storage

Freshly harvested potatoes are more perishable than retail producers like. So growers put most potatoes through a curing process which gives them a chance to develop thicker skins and to heal bruises and cuts they receive during harvest and transportation. They do this by storing them for two weeks at 50° to 60°F (10° to 15°C) at high humidity. Then they slowly lower the temperature to between 45° and 50°F (7° to 10°C), the ideal long-term storage temperature. Potatoes keep for as long as 9 months at this temperature if the storage space is dark, has good ventilation and high humidity. Potatoes stored all winter are still in reasonably good condition in the spring when the new crop is not yet on the market.

New varieties and novelty potatoes

Agricultural research centers and even growers are interested and active in developing new varieties that satisfy all the links along the chain of distribution, including the consumer. We will continue to see improvement in both flavor and ease of cooking. For instance, a new variety (late 1990s) called Cal-White has not only a pleasant flavor but is particularly well-suited for cooking in the microwave oven.

The more unusual specialty potatoes, also called *novelty potatoes*, are rarely if ever available to the average consumers. Generally small farms grow them and distributors sell them to high-end restaurants, clubs, institutions and specialty food markets. Occasionally you may find them in the well-stocked produce department of a supermarket. Of course, they sell at premium prices. Do they taste better than other potatoes? Sometimes but not often. Chefs like them because of their unusual appearance, color, size, or simply as a substitute for the everyday potato that is mundane and difficult to present on the plate in a new and distinctive way.

There are about two dozen varieties of these novelty potatoes, some of them new breeds. Many of these are small in size and range in color from the accustomed tan, white or red to the less usual indigo blue, purple, black, deep magenta and golden yellow. Some have speckles and stripes of color throughout their flesh.

Here are the ones that you are most likely to run across, perhaps not in the produce section but on your plate in a trendy restaurant:

1. **Yellow Finn** or **Finnish yellow wax** is small or medium-sized with pale yellow, rather rough skin and solid, smooth, cream-colored flesh. They are excellent boiled, baked or in salad. This is the best-known of the novelty potatoes.
2. Several varieties of **blue potatoes** exist which have grayish-blue or purple skins and sometimes blue or purple flesh. Others have white or gray flesh speckled with blue. They have a delicate flavor and are best when boiled. Cooking, unfortunately, dulls the beautiful blue or purple coloration.
3. **Fingerlings** is a general term for several kinds of small, knobby, finger-shaped, potatoes. They are waxy, flavorful and best steamed, boiled or baked. You most commonly come across the varieties called **rose Finn**, **purple Peruvian** and **German fingerling**.

Some of these specialties that are rare to us are common locally elsewhere in the world, particularly Yellow Finns. When growers tried them in the past, American consumers didn't care for the yellow flesh so farmers stopped growing them. But they are favored and popular in Europe and Israel. Now Americans want something different and these same ordinary Yellow Finns are proudly returning as sophisticated fashionable potatoes.

Mountains of potatoes

We use potatoes not only to feed ourselves but also our stock animals and as industrial raw material for such products as starch, alcohol, dextrin and glucose. But most of them (84 percent in U.S.) end up on the table. An amazing two-thirds of those destined for human consumption end up in processed food, particularly French fries for the food service industry and potato chips for the snack market. We eat the remaining one-third as fresh potatoes. While eating fresh potatoes continues to shrink slowly in North America, the food processing industry is using more all the time.

Food processors may freeze potatoes after frying, make them into chips, dehydrate and

can them. Because consumers demand it, they usually peel potatoes before processing, an unfortunate fact because much of the nutrients peel off with the skin. Industrial peeling is quick and efficient process, very different than what we do in our kitchens. Instead of hundreds of grandmotherly types peeling away with paring knives, abrasive rollers and discs with powerful water sprays remove the skin. Another method is immersion in a hot caustic solution of sodium hydroxide for a few minutes. This bath softens the skin sufficiently so that powerful water spray and brushes easily remove it. A third method uses pressurized steam to soften the peel, and again powerful water spray and brushes remove it.

Potatoes destined to be French fries receive a blanching in hot water to gelatinize the starch. This improves the texture and reduces oil absorption. (The industry doesn't reduce oil absorption to lower your fat intake. The most expensive part of frying potatoes is the oil, so they try to reduce oil that goes out the door with the potatoes.) Blanching also kills the potato and stops enzyme activity, giving the product a much longer shelf life. Finally, blanching leaches out some of the sugar from the potato, that may caramelize in the hot oil, that would give too dark color and a slightly bitter, even burnt flavor.

Remember those smooth, creamy mashed potatoes they served in the school cafeteria that tasted like puréed and creamed talcum powder? They make them from dehydrated potatoes which have shelflife measured in decades (if not centuries). The packaged instant potatoes are the same species. To make them, the processor peels the raw potatoes, blanches and cools them, then heats them up again in water and steam to cook for 20 to 30 minutes before mashing them. They add an emulsifier to prevent stickiness followed by more chemicals to prevent darkening, and still others to prevent oxidation. After cooling and drying there is a mass of dried white lumps, which they break up into granules or flakes. And there you have instant mashed potatoes for the non-cooks.

Spuds in your kitchen

You cannot easily duplicate ideal storage conditions for potatoes in your home so don't buy more than what you can use in a few weeks. Thick-skinned potatoes keep longer than the thin-skinned varieties. If stored above 50°F (10°C), potatoes begin to sprout, which makes them flabby and more susceptible to decay, even though most storage potatoes are chemically treated to delay (but not stop) sprouting.

If you store them in your refrigerator, potatoes turn sweet and taste unpleasant. Here is what happens. After harvesting, the still-living potatoes continue to breathe and to convert their starch to sugar at a slow rate, the way they naturally do. When you quickly cool them to refrigerator temperature, potatoes slow their breathing rate (because breathing slows at cooler temperature), but the reaction that converts starch to sugar continues at the same rate. They cannot use up the sugar fast enough, it accumulates and refrigerated potatoes taste too sweet. The sugar converts back to starch if you return the potatoes to room temperature, but the process doesn't reverse completely. Because of the increased sugar, refrigerated potatoes are particularly poor choice for frying. The sugar caramelizes in the hot oil, the potatoes tend to burn and become bitter.

You should store potatoes under well-ventilated conditions so they can continue to breathe. That is one reason why the plastic bags in which they are sold always have little breathing holes.

For long-term storage, add an apple to the potatoes. The presence of apple preserves

potatoes longer in firm, healthy conditions and discourages sprouting. Apple gives off ethylene gas and alcohol while it breathes that suppress sprout formation.

Cooking potatoes is one of the first thing a new cook learns. Not much to it but keep in mind a few points:

- use just enough water to cover (to leach minimum of nutrients)
- salt the water, otherwise you leach the natural salt from the potatoes and they taste flat
- don't overcook or undercook, so keep testing with the point of a knife or skewer; cooking time is around 15 minutes for diced potatoes but varies with your location and how large the dices are. Average-size whole potatoes cook in about 30 minutes, large ones 45 minutes.

When baking potatoes, don't cover with aluminum foil unless you like soft skin. In foil potatoes steam instead of bake. But oiling or greasing the skin before baking promotes browning and crispy skin. Pricking the skin with a fork or knife before baking is also a good idea to prevent a possible explosion in the oven that could happen if the potatoes have tough skin and the built-up steam inside cannot escape. It makes quite a mess in the oven.

French frying is a messy operation even with a home deep-fryer but properly-made French-fried potatoes are delicious. In deep-frying you reduce the high moisture content of potatoes from the original 78 percent to about 2 percent. The moisture turns to steam in the hot oil, desperately trying to escape while spattering oil everywhere, creating a mess. As bubbles of steam burst when emerging from the surface of oil, they produce a small hissing sound. All the bursting bubbles together act like an orchestra to create that pleasing sizzle with its anticipation of that heavenly deep-fried taste.

The steam escapes first from the hottest part of the potatoes, the surface which is in direct contact with the hot oil. Then, as the center part of potato gets hotter, moisture starts turning to steam that escapes through the outside part. Eventually not much water remains in the potato and the sizzling dies down. The outward pressure of escaping steam keeps the oil from seeping into the potatoes, but the steam also cools their surface to prevent burning (evaporating water cools, like your skin after coming out of the pool). When most of the moisture has boiled off, the potatoes become vulnerable to burning but also start absorbing more oil.

Oil temperature is critical. If the oil is too hot, the surface of the potatoes burn before the inside is properly cooked. If the oil is too cool, the escaping steam doesn’t have enough pressure to keep excess oil out of the potatoes. The correct deep frying temperature is 375°F (192°C). Unless you have a thermometer or a thermostat on your deep-fryer, there is no easy way to judge that. Various home methods, such as browning a certain-size bread cube in so many seconds that some cookbooks suggest, are not accurate enough when oil temperature should be preferably within 15° of the ideal. For that reason the results of home French-frying is not often as satisfying as French-fried products in a good fast-food joint.

The best method of deep-frying potatoes is the two-stage method. In the first stage you cook the potatoes in oil at a lower temperature, 325°F (161°C), until they are limp but not brown, about 3 to 4 minutes. In this stage the oil is hot enough to gelatinize starch, in other words, to cook the potatoes. In the second stage the already cooked potatoes quickly brown at 375°F (192°C).

Perfect French fries

Home-made French fries are somewhat of a messy operation but if you don't mind the cleanup, they are worth it. With carefully-controlled oil temperature, using the two-stage method and reasonably fresh oil, your fries will not absorb too much oil. (See text above for discussion.)

You need plenty of oil for deep-frying. With too little oil the temperature drops too much when you add the potatoes and they start absorbing oil.

Ingredient

Dry, mealy type baking potatoes, washed, unpeeled, cut into French fry stick about a finger thick

Deep-frying oil

Procedure

1. Wash potatoes thoroughly to remove excess starch, then dry them with a towel as much as you can (to add minimal moisture to the oil—any extra water you add reduces oil temperature).

2. Heat oil to 325°F (160°C), lower potatoes gently into the oil in a frying basket. Avoid temptation to hurry the process by adding too much potatoes. Lift the basket out for a second if there is a danger of overflowing. The steam comes very vigorously at first. Cook until they are limp but not brown, about 3 to 6 minutes. Remove potatoes, cool them for 5 minutes. In the meantime heat oil to 375°F (190°C).

3. Lower the basketful of potatoes in the hot oil again in the second frying stage. They brown fast, in about 5 minutes. Remove when crisp but before they turn dark, drain and soak up excess oil on paper towels or in a brown paper bag then sprinkle with salt.

Poisoned potatoes

Strong light also affects stored potatoes. All potatoes contain an alkaloid called *solanine*, and most alkaloids are poisonous in high doses. Potato leaves and stems contain a lot of solanine. At normal concentrations there's not enough in the potato itself to be harmful, and it actually contributes to the total flavor. At high concentrations it has been known to cause severe poisoning. It is a chemical process that produces solanine aided by sunlight or strong artificial light.

Solanine usually develops within the skin and just under it. Luckily we can see when solanine concentration is high because the green-colored pigment, chlorophyll also develops in the potato along with the solanine. When you see green spots on your potatoes, they signal that the solanine may be 5 to 10 times the normal concentration. With high levels of solanine the potato also reaches highly toxic levels, and it develops a burning, peppery flavor, giving you ample warning that something is not right. Heat doesn't destroy alkaloids, and they are not soluble in water as some toxins are. The only solution is surgery. You don't have to throw away the whole potato as many cookbooks suggest. Just cut out the green parts. They are, like beauty, only skin deep.

While bean and alfalfa sprouts are great additions to salads, potato sprouts are good only if you don't wish your guests to return to your dinner table ever again. Potato sprouts are also rich in solanine, even though they may not be green. Pick off the sprouts before cooking and don’t add them to your salad.

You may have seen the produce clerk at the supermarket removing covers from the potato bins just as they open their doors early in the morning. The covers are not to keep the flies off. At most supermarkets the overhead lights are on all night for the reshelving and for the cleaning crew. Since light is deleterious to potatoes (and develops the poisonous solanine), a well-informed produce manager covers the potatoes as long as there are no customers in the store. The dark amber or rose-colored bags they often package potatoes in is to protect them from strong light, too.

Sometimes when you cook or bake potatoes, you must have noticed that the ends turn black. This is not toxic, just unappetizing, that heat causes. If you have similar problem with a whole batch you just bought, acidify the cooking water by adding cream of tartar (an acid in powder form) when you cook them. (This, of course, doesn't work when you baking them.) If you want to know the chemistry behind stem-end blackening, read on. Ferrous oxide (Fe^{2+}) oxidizes to ferric oxide (Fe^{3+}) on heating and reacts with chlorogenic acid in the potato to form a dark-colored spot. Why at the ends only is a mystery, that only food scientists can figure out. Tartaric acid from cream of tartar binds with the iron and eliminates the blackening.

Occasionally you end up with black spots in other parts of the potato. These are the result of bruising. There is no visible sign on the outside that you have an injured spud. The chemistry of these black spots is the same oxidation as in stem-end blackening.

Surface browning of the freshly cut-up potatoes (called enzymatic browning) is easily to solve. As you cut them up, drop them into water and the harmful oxygen in the air cannot reach the surface.

One more reaction within the potato that concerns us is the gelatinization of the starch granules. Potatoes are about 78 percent water, 20 percent carbohydrates and 2 percent protein. Most of the carbohydrate is in the form of starch granules which are tiny, discrete, fairly hard, elliptical-shaped grains that make up the body of the potato. They don't taste pleasant, which is why no one eats potatoes raw. The starch granules gelatinize when you apply heat (137° to 150°F or 58° to 66°C), just like when you bake bread or cake. This temperature range is called the gelatinization range, and is an all-important reaction in potato cooking or baking. The compact starch granules absorb water from the surroundings and swell up to many times their original sizes, forming a soft, moist amorphous mass.

When you stick a skewer in a still-baking potato to test for doneness and the center still feels hard, what you feel is a mass of ungelatinized starch granules that haven't yet reached the critical gelatinization temperature. Once the inside is around 150°F (66°C), the potatoes are done and ready to serve. But to develop a brown skin and full, rich flavor, wait until the temperature is close to 190°F (88°C). You may want to stick an accurate thermometer in the potato next time instead of a skewer to check for doneness.

The fact that potatoes are so high in starch gives them great thickening power in soups and stews. The starch granules are pretty well bound together in the raw potato, but as you cook the pieces, some escape into the surrounding liquid and gelatinize, swelling to many times their original size by absorbing, thus thickening, the liquid. To thicken even more, grate a little raw potato into the soup before cooking.

Points to Remember

- ♦ You don't need high-priced import to make good pasta. Any pasta works that cooks into firm, non-sticky product.

- Cook pasta in plenty of boiling, salted water until still slightly chewy. A rough guide is to use at least three times water than dry pasta with 1 tablespoon salt per gallon. Oil in water and rinsing after cooking are not necessary. Add oil after cooking to keep pasta from sticking.
- In baked pasta dishes, you don't need to pre-cook pasta.
- Cook 2 to 3 ounces (55 to 85 g) of dry pasta per person.
- Dry pasta has almost indefinite shelf life. Cooked pasta keeps well either refrigerated or frozen.
- Use long-grain rice for most culinary purposes, glutinous or sweet rice for desserts and in some Asian dishes.
- Use aromatic and basmati rice only if the food doesn't overwhelm their subtle flavors and aroma
- Choose any of three cooking methods for perfect rice: boiling in plenty of water, cook in oven or by absorption on stove top.
- Rice generally doesn't need rinsing or soaking.
- You may store white rice indefinitely but brown rice has shorter shelf life. During summer or in hot climate store it in the refrigerator.
- Wild rice cooks the same way as brown rice.
- Wild rice keep indefinitely.
- Potatoes are either high-starch, dry and fluffy type (for baking frying, deep-frying) or low-starch, waxy and moist type (for salads, boiling, scalloped).
- Keep skin on potatoes whenever possible to preserve nutrients.
- Store potatoes in a cool, well-ventilated, humid place, never in closed plastic bags or in refrigerator.
- Cook potatoes in just enough salted water to cover. Avoid over or under-cooking.
- Use two-stage frying technique to deep-fry potatoes.
- Cut out any green parts off potatoes.

There will be no beans in the
Almost Perfect State
Don Marquis

LEGUMES

HIGH FLAVOR, HIGH NUTRITION, LOW COST

Most Americans regard legumes with unassuming disdain, yet our southern neighbors adore beans, this top dog of legumes. The Depression probably had a lot to do with their unpopularity. Many people survived on beans when they could not afford to buy anything else, and even though that was several generations ago, beans are still considered a poor substitute for the real thing, meat, in many American households. The only cuisines that often feature them are Hispanic, vegetarian and some Asian. With the immense popularity of southwestern cooking, and the push to eat a healthier diet, more beans are finding their way into cooking pots and onto dinner plates in American and Canadian dining. In 1997, Americans ate 7.8 pounds (3.5 kilo) of dry beans annually per person, predominantly in the southern and western parts of the country.

World Consumption of Common Beans
(appr. 1995)

Latin America	46.4%
Africa	24.3%
Western Europe	6.3%
Eastern Europe	7.0%
Asia	4.5%
Middle East	4.0%
North America	7.5%

All legumes belong to a single plant family *Leguminosae*. It is a huge family with at least 16,000 known species. We eat only 20 of these commonly, but there are scores of other varieties, each one popular in different parts of the world.

Humans have cultivated legumes almost forever—they are easy to cultivate and they survive under poor conditions. Lentils are the oldest, and their history goes back 9000 years. Beans, peas and other members of the family are relative newcomers, only 5000 to 6000 years old. Soybeans and mung beans are native to Asia, lentils, peas and many common beans are native to the Near East, while peanuts (also legumes) got their start in Brazil.

Farmers often grow legumes together with cereal grains. In the field, grains and legumes establish a symbiotic relationship just as they balance each other's nutrients in human diet. Legumes enrich the soil with nitrogen from the air, while grains use it up. Farmers, if not growing them together, alternate crops of beans and grains in the same field to take advantage of this. In our diet, it is the essential amino acids (types of proteins) in both grains and legumes that complement each other perfectly—eat them together for all your protein needs.

Legume Nutrition

Of foods of animal source, eggs and milk are the most nutritious for human consumption. Of foods of plant source, the equivalents are nuts and seeds. Nature designed these for identical purposes—to nurture a growing animal or plant embryo into maturity while providing complete nutrition and energy, except water. In these foods proteins, vitamins and minerals provide full nutritional needs, while carbohydrates and fats provide energy for growth.

Legumes are plant seeds, just like any other seeds such as sunflower seeds or caraway

seeds, but legumes we eat in hot cooked dishes, never raw. Legumes, with the exception of soybeans and peanuts, contain no fats. In that respect they resemble vegetables more than seeds.

Nutritionally, all legumes are high in protein and carbohydrates. The Table below shows that most legumes contain between 20 and 25 percent protein. That is a very high range. Our meats, in comparison, contain between 15 and 22 percent. Soybeans and peanuts are the only legumes with fat, with 19 and 52 percent, respectively. (That translates to 22 and 59 grams in a 4-ounce or 113-g serving.) Legumes don't have many vitamins when compared to other vegetables, but most of whatever they have they retain in cooking. The U.S. Department of Agriculture has found that even when cooked a long time, legumes retain 70 to 90 percent of their nutrients.

Although very nutritious, legumes don't provide complete protein for the human body. When we eat them with complementary grain products—bread, rice or corn, for instance, they provide a complete set of essential protein components, called amino acids, that our bodies require.

Legumes are high in fibers that our bodies need for the smooth operation of the digestive tract.

TASTINGS. **Is beer nutritious?**
Can we count beer as one of our daily grain meals of the Food Pyramid? After all, brewers make beer from grain. It is a pity, but beer doesn’t count. Although beer is made from grains that are high in proteins, it doesn't supply the proteins you need because during fermentation the proteins in the grain are significantly altered. Yet beer provides for your body’s pleasure needs.

Sprouting seeds change their original nutritional profile. Bean sprouts contain 3 to 5 times the vitamins of the original dry seed, but in absolute terms they still are not vitamin-rich when compared to green vegetables. The protein content remains the same as in the original unsprouted from, but the carbohydrates (and oil in soybeans) decrease because the growing plant embryo uses them for energy. Except for the protein they contain, sprouts are not very nutritious. But they are great additions to salads and stir-fries for their texture, flavor and appearance.

Legume Nutrition
% of total legume

	Protein	**Fiber**	**Carbohydrate**	**Fat**
Common beans	23.6	4.8	62.8	1.5
Soybeans	34.3	3.8	31.6	18.7
Peas	24.5	4.0	62.0	1.1
Lentils	27.7	4.1	61.2	1.0
Chickpeas	19.5	4.0	61.7	5.7
Fava beans	24.8	7.0	60.4	1.4
Peanuts	27.6	2.0	13.3	52.1

Legume Basics

Legumes are all edible when young in the pod, although we only eat beans, peas and fava beans at that stage of growth. We are more familiar with legumes after they fully mature and dry. In fact, a major contributing factor to their historical popularity, besides their nutritional value, is that they store so well in dried form—almost indefinitely without deteriorating. A third way we eat legumes is freshly sprouted. Dry legumes, like most seeds, quickly sprout in moist, warm conditions, providing flavorful and crisp sprouts, but only modest nutrition. It is in the dried form that most legumes find their ways to our dining tables.

Once legumes reach their mature stage, the pods become dry and brittle, they crumble and release the seeds. Before the farmers can be harvest legumes, the pods must dry thoroughly on the vine. Though they originally contain a lot of water (about 80 percent), by the time they are fully dried, their moisture content is less than 20 percent.

If we look at a seed under the microscope, we find three parts. The central mass of substance is the main storage area for the new plant, called the *cotyledon*. Inside this mass is the embryo of the new plant complete with two tiny leaves, roots and stems. A tube attaches this embryo to the mass of cotyledon, and once the plant emerges, the embryo receives its food supply through this tube, like human embryo through an umbilical cord. The third part is the seed coat, which acts like our skin. It keeps the whole thing together and protects it from external threats. To serve this purpose, it needs to be tough—a significant fact for cooks, because it is the last thing to soften on cooking. If we cook legumes too long, the skin bursts, spilling out the soft, mushy insides.

The seed coat is tough but it doesn't protect the seed from hungry insects and animals with sharp teeth and strong jaws. The bean needs other defenses to combat them. Its first defense is two proteins (*protease inhibitor* and *lectin*) that interfere with digestion of an animal that is foolish enough to eat the seeds raw. Scientists have shown in experiments that animals fed only raw soybeans actually lose weight because it takes more energy to digest them than they provide. Rather than learn how to cook them, as we did, animals learned to avoid the raw legumes—those that didn't died of starvation. One of these two proteins (*lectin)* provides another protective mechanism—agglutination. It actually causes cells in the eater's body to clump together. When scientists feed rats only raw beans, they die within a few days because of this.

There's still another line of defense, this is more straightforward. Many legumes contain the toxin cyanide, that kills any hungry creature that attempts a meal from them. Don't worry much about this one, though. Only lima beans contain enough to cause a problem in the human body. Older varieties of lima beans had to be cooked thoroughly to eliminate cyanide. Newer varieties people grow in most parts of the world have had most of the cyanide bred out of them. However, even if it contains cyanide, properly cooked lima beans is not poisonous. Cooked in an uncovered pot the cyanide evaporates. A covered pot traps it, and it falls back into whatever is cooking in the pot. While heat can deactivate the cyanogenic compound in lima beans, cooking old varieties in a covered pot could deactivate you.

Don't take beans out of your diet because of what you've just read. Heat gets rid of the two proteins that interfere with digestion and the cyanide as well.

TASTINGS The killer lima bean

During World War I, when lima beans were imported to Europe from Java, Puerto Rico and Burma, serious poisoning incidents occurred resulting from their high cyanide content. People even died. In the new hybrids of lima beans there is no harmful amount of its cyanide toxin left. But in some parts of Asia, illness and

death from eating improperly cooked lima beans is not uncommon, because they still grow older varieties.

Legume varieties

Of the 20 major species of legumes we find 7 that are reasonably well known in North America:

1. Common beans with about a dozen varieties
2. Lentils—the most common variety is brown lentil
3. Peas—yellow, green and black-eyed
4. Chickpeas—we also know it as garbanzo beans by its Italian name
5. Fava beans
6. Soybeans—we use very little directly for food, but for its oil and in innumerable soybean products
7. Peanuts—always popular in many forms; we use them as nuts

We cook beans, lentils, peas and chickpeas in many different dishes, fava beans much less frequently, and usually as fresh young vegetables. We use soybeans in a variety of forms but rarely by themselves—we combine them with other ingredients. The seventh popular legume, the peanut, we actually use as a nut, so I included it in the chapter on nuts.

Here is a list of the 13 best known common beans among the hundreds of varieties:

Adzuki (or Chinese)
Black (or turtle)
Cranberry
Great Northern
Lima (both baby and large)
Mung (both green and black)
Navy
Pinto
Red kidney (both light and dark)
Pink
Small red
Small white (or California small white)
White kidney (or cannellini)

While most of the common beans look different, they have very similar flavor. You probably could not tell one from another unless you were taste-testing them side by side. Tradition, however, demands a specific bean for a specific dish. For a chili con carne, for instance, we prefer pinto beans, for Boston baked beans, navy beans and for the Southern hopping john, black-eyed peas. But don't be afraid to substitute with whichever you happen to have on hand. It is what you add to them that gives the flavor definition.

TASTINGS The uncommon legumes
We have three edible legumes that are rare in cooking but may find their ways in some of your kitchen. Carob, a substitute for chocolate (though the only thing common with chocolate is the dark brown color), the spice fenugreek, common in Indian cooking and mesquite, a tree whose seed is edible. Our culinary connection with it is the wood, not the seed which gives a nice smoky flavor to foods when we use it as charcoal or just chips on common charcoal.

The magical soybeans

Soybeans enjoy having their own privileged class. They are unique with an amazing protein content of 34 percent, one of the highest of all foods (compare that to meats that range

from 15 to 22 percent). Yet, we hardly ever eat them. Even though they are an impressive source of protein, they have flunked the palatability test in every country anyone every tried to introduce soybeans as a staple. But all those soybeans are not wasted. We use its oil either directly or indirectly in all kinds of consumables goods. The soybean protein is a prime animal feed, but it also provides a significant protein source in its many permutations for vegetarians.

Interestingly enough, soybeans are a very recent introduction to U.S. agriculture, yet in a few decades they have become her single largest cash crop. Although we don't eat them either fresh or in dry form as we do other legumes, we consume plenty of them in other ways. Most of us have never had a bag of soybeans in our kitchen cupboards, yet we recognize the coagulated or fermented products derived from them.

Foods from the soybean

There are five soybean-derived foods (excluding oil) that you come across on many supermarket shelves. They were virtually unknown in North America in the 1940s and 1950s. Two of these became fairly common: soy sauce (and its cousin tamari sauce) now in nearly every kitchen and tofu. The other three are not so well known: soy milk, tempeh and miso. Tofu and soy milk are unfermented, soy sauce, tempeh and miso are fermented products. The Chinese have been using fermented soybean products for at least 2200 years.

Tofu is soybean curd, very similar to unripened cheese curd both in flavor (they both have none) and the way they make them. First they soak the dry soybeans overnight. Then they crush and cook these lightly hydrated but still hard beans until they turn into a mush. After filtering off the liquid, which is the soy milk, they add calcium or magnesium salt to coagulate the curd. They put this semisoft solid into wooden forms and press it for several hours to squeeze more of the liquid whey out.

Starting with 4 pounds (4 kg) of dry soybeans they end up with about 6 pounds (6 kg) of tofu (the increased weight is water) plus the whey that they discard. Tofu is an ideal medium for bacterial growth and spoils very quickly at room temperature. That is no problem in the Orient where they eat tofu the same day they make it. The American food distribution system requires far longer shelflife than one day, so processors pasteurize tofu and seal it in a package for weeks of shelflife like they do cheeses.

Tofu comes in different textures from very soft, smooth, fragile, silken cakes to hard, solid, almost cheese-like bricks. The difference is in the amount of whey left in it. Soft tofu is about 85 percent, while the hard stuff is only 50 or 60 percent water. Hard tofu, often flavored with sugar, tea and spices, is the preferred form in many parts of China. Elsewhere, soft tofu or an in-between consistency is more popular.

By itself, tofu is bland and flavorless, virtually unpalatable. But it adds great texture to foods. It acts like a sponge for flavor compounds, so it takes on flavors from all other ingredients. It is good in soups, salads and stir-fries. It is suitable to marinate, to bake, to braise or to sauté just like meat. My recommendation to you is to try it at least once, no matter how reluctant you feel about tofu. For instance, why not marinate tiny tofu squares in an intense Oriental sauce for a few hours, then add them to your salads. Wow!

Tofu is now available commercially in different flavors and forms that replicate meat (called value-added products)—tofu burgers, baked teriyaki and barbecued tofu, cutlets of tofu in marinade, tofu blocks marinated in Italian, Thai or Oriental flavors, or whatever the trend of the moment happens to be. Although plain tofu is inexpensive, these value-added products are not

cheap. You will probably pay almost as much for them by weight as for medium to high-priced meats.

The protein content of tofu is not very high, only about 7 percent, because of the large amount of diluting water it contains. The harder the tofu is, the less water and more protein concentration in a same-weight piece. A 4-ounce (113-g) tofu, in dietitians' language, contains 8 to 10 grams of protein.

Soy milk the other unfermented soy product, is the liquid that results from the first step of the tofu-making process. However, more cooking and processing are necessary before the liquid becomes suitable and acceptable to drink as soy milk. The processor adds salt, sweetener, oil and flavoring to give it a little taste. Without them, it tastes like plain tofu, very blah!

Soy sauce is to Orientals what ketchup is to Americans. Each country, and even districts within country, has its own ways of making it and each one may be very different from the other. Soy sauce has become very popular in our kitchens, too.

To make Japanese soy sauce, the processor cooks the soybeans and adds roasted, and coarsely crushed wheat berries. The ratio of the two differs in every region. Then the processor inoculates the mash with a specific mold *(Aspergillus*) and lets this mixture mature for about 3 days under controlled temperature and humidity conditions to develop enzymes. After that he adds a brine solution to destroy the mold. The result, *moromi* mash, is what ferments and ages in fermentation tanks at natural temperature for about 2 years. Fermentation for our domestically produced soy sauce is only about 6 months but under controlled temperature.

During the fermentation, two processes take place. In the first one the proteins of the soybeans are broken down into their component amino acids, and in the second the carbohydrates of the wheat kernels change to sugar. The brine is also part of the process. It introduces saltiness and triggers a new set of chemical reactions between the amino acids and sugar. A yeast fermentation runs simultaneously with these changes that alters part of the sugar into alcohol, introducing a tart flavor component. The result is a further deepening of flavor with even more complexity and the development of a rich, clear color. Aging follows fermentation and the two processes take 6 months to a year, after which they filter off the reddish-brown syrupy mash under pressure to squeeze out every single drop. Then they pasteurize the liquid before bottling to get rid of any remaining live culture.

Chinese soy sauce is somewhat different. They make it without wheat and is both thicker and heavier than the Japanese variety. The Chinese add molasses to give sweetness and a dark color.

Tamari is similar to the Japanese-style soy sauce but has little or no wheat, is darker, heavier and stronger-flavored than soy sauce.

Salt makes up a very high 15 to 20 percent of any soy sauce, so don't use it too generously. It generally replaces table salt in recipes.

Tempeh is a close relative to tofu. Tofu is unaged and unfermented. Tempeh is also unaged, but it is fermented for a day under warm, humid conditions with inoculated mold culture so it develops a mild flavor. Otherwise, it is a white cake-like food similar to tofu. Tempeh originated in Indonesia and because it is more tasty than tofu, it is popular with vegetarians as a meat substitute. You can buy tempeh in health food stores flavored with seaweed, soy sauce, five-spice or just plain sea veggies. Sometimes they fortify it with extra cooked soybeans. It has the same protein content as tofu (about 7 percent) unless has the benefit of added soybeans. That boosts the protein content up to a respectable 21 percent (24 grams in a 4-ounce or 113-g serving).

Miso is a Japanese fermented product that begins with soaked soybean mush into which they mix either pre-fermented soybeans, rice or barley. The processor inoculates this conglomeration with mold, and ferments it for a few days. Then he blends, mashes and pasteurizes the mush, and it is ready for sale in sealed jars or in bulk in health food stores. In bulk it is like thick porridge. It has a complex, distinctive taste which makes it good for flavoring and as a soup base. The cost is about the same as a medium-priced meat. The protein content is around 13 percent (15 grams in a 4-ounce or 113-g serving) depending on what other ingredients they have added.

The Downside of Legumes

Eating legumes has its downside, at least for some people—they are hard to digest and cause flatulence. Some people have such strong reaction that they won't even eat them. Part of the problem for most is not eating them regularly. Our digestive tracts don't support the microbes and enzymes that we need to break down and to digest legumes, particularly beans. In Latin America where people eat beans daily, or India where they eat lentils as frequent part of their diet, people don't have trouble digesting legumes. Why?

Starch, made up of sugar molecules called *oligosaccharides,* is what causes the problem. Other plants have similar problem starches, but legumes contain the most. If your digestive tract doesn't have the microbes and enzymes to break the starch down, it moves into the lower intestines unaltered, where bacteria take over to work on the undigested legumes. Their busy work generates plenty of gases that distend the bowels enough to cause discomfort and finally embarrassment with the escaping gas.

Ben Franklin, who loved beans, went so far as to propose a scientific prize in 1781 to whoever could come up with a substance to alleviate the result of eating beans. No one yet has claimed the prize with an appropriate solution to date.

For some reason, individuals differ markedly in the amount of gases that accumulates with this breakdown of starch. For some people, it could be an occupational hazard. There is a thorough, careful screening for applicants to be astronauts and high-altitude fliers because the discomfort caused by the build-up of gases at a lowered atmospheric pressure can be more than just a little pain in the tummy at high altitudes.

There are many suggestions on how to avoid, or at least reduce, the generation of these gases. The most frequently given advice is to get rid of the offending starch. Soaking the beans dissolves some of it, and discarding the soaking water gets rid of any dissolved starch. Some people go so far as to discard the soaking water, bring the beans to a boil in fresh water, then discard that water, too, before adding fresh water for cooking. There are two problems with this method. One is that it doesn't get rid of all the oligosaccharides. The other is that some of the nutrients also soak out that you toss. Certainly the proteins and most of the carbohydrates are not affected by soaking.

Here is what the California Dry Bean Advisory Board suggests. Add 10 cups boiling water to every pound (half kilo) of dry beans, boil 2 minutes. Cover and let stand about 8 hours. The heat kills potential life in the beans, the cell membranes break down during soaking and release 75 to 90 percent of the water-soluble indigestible sugars. Drain and replace with fresh water before cooking. If you skip the step of boiling water and soak it in cold water, the beans remain alive and start the germinating process. More of the offending sugars remain in solution because the cell membranes are still intact.

If you have problems with flatulence but love legumes, try eating them more often to see if your system can adapt naturally to their digestion, like it does for other legume-eaters. Several commercial products are also available in pharmacies (one is called Beano) that contain an enzyme to break down the starch before it gets into the lower intestines. Add these to your first bite of beans so the enzyme is ready to work right away. These products don't help everyone, but they take care of legume hangovers for many.

TASTINGS Does Beano help?
In 1995, University of California researchers at San Diego tested a group of volunteers under controlled conditions. The volunteers feasted on high gas-producing foods—beans, broccoli, cabbage, cauliflower and onion. Some had several drops of Beano, others a placebo, in their dinners. The researchers surveyed them at regular intervals for discomfort of flatulence during the next 4 hours. In the 5th hour of digestion, no-Beano group had 4 times the "flatulence events" than the Beano group did.

Legume Behavior in the Cooking Pot

Legumes are not only highly nutritious and inexpensive but amenable to an infinite number of flavorful preparations. A short list of their uses includes the traditional baked beans, refried beans, any number of combinations of bean salads, then the huge selection of lentil, pea and bean soups.

Cooking does five things to legumes:

- It gelatinizes the starch to make it palatable and soft.
- It rehydrates the dried seed changing its water content from 20 to 60 percent.
- It develops flavor through chemical changes.
- It improves texture.
- It destroys toxic substances and proteins that interfere with digestion.

Beans, lentils and peas all have a pleasing flavor and a toothsome texture, yet they are pretty bland if you serve them unadorned. Like other starchy vegetables, such as potatoes, they are best when you offer something more flavorful to accompany them or properly dress them up with herbs, spices and other flavorings. They have the make-up and capacity to absorb flavors readily, and, again like potatoes, they lend themselves to almost limitless kinds of preparations.

Few foods are easier to cook than legumes. I'm always amazed to find a good cook who relies on the canned versions, when fresh-cooked have so much more flavor yet easy to prepare. Plenty of old, unfounded myths accompany the cooking of legumes. I'll address some of them and, hopefully, encourage you to pass by the canned versions in the market and cook your own.

To soak or not to soak

The first myth is about presoaking. Most cookbooks, and even the American Dry Bean Board, direct you to do so. Presoaking requires planning and that turns many cooks off. Soaking is certainly a good idea (it saves time and energy), but, contrary to common belief, it is not necessary. I conducted an experiment with red kidney beans, cooking a batch of presoaked and unsoaked beans in two separate pots to the same degree of softness. The presoaked beans were

tender in 25 minutes, the unsoaked beans took 65 minutes. The flavor and texture of the two batches were exactly the same. In subsequent experiments I've found that almost all beans cook to the soft stage in little more than an hour without presoaking. (Depending on the hardness of your water, your elevation and the type of beans, cooking time may be longer.)

If there is time, presoaking makes sense for faster cooking. Soak the beans for a minimum of 4 hours. Longer soaking doesn't hurt the beans, but it does not shorten cooking time any more. But if you don't have the time, try to avoid opening a can. Go ahead and cook the washed beans—they will be ready in about the same time or a little longer as baking large potatoes in the oven.

Peas and lentils cook so fast that you never need to soak them. They are soft in 20 minutes.

Cooking beans

According to experts, the older the beans, the drier they are, and the longer it takes to fully rehydrate and soften them. The experts also claim that they lose their flavor after a year in storage. My kitchen tests found these to be unfounded myths. I cooked two batches of black turtle beans side by side. One batch was 3 years, the other was 3 months old (counting from harvest time). Both batches cooked to softness at the same time, and there was no noticeable difference in their flavor. I also cooked beans that were in storage for at least 10 years. They had excellent flavor.

Cooking time increases with higher altitude and harder cooking water. The recommended cooking time on packages is far too long, no matter what the circumstances. I tested the cooking time for kidney beans with package directions given as 1 to 1½ hours after overnight soaking for a tender stage. The beans (cooked at sea level in soft water) were fully tender in 25 minutes. Start testing a cooking pot of beans 30 minutes before the recommended time is up, then drain them as soon as their texture is to your liking. Those destined for mashing as refried beans need to be cooked a little softer. Beans for soup, salad, chili and baked dishes can be more chewy.

San Joaquin bean and corn salad

The bean salad in this recipe is a far cry from that simple three-bean salads of traditional summer picnics, far prettier to look at, a great deal more nutritious with a delectable flavor and lot more work. It was inspired in California’s San Joaquin Valley, origin of many of today’s legumes.

This yields 4 solid pounds (nearly 2 kg) of salad, serving 8 to 12, depending on what else is on the table. Since it holds very well in the refrigerator for 5 to 6 days, consider preparing the full quantity and serving it several times. Preparing the full recipe takes very little extra time over making, say, a quarter of it.

For a really attractive appearance, I suggest using two different kinds of beans if you have a little extra time for the extra cooking effort. Since this is a salad, you may substitute some ingredients, but do not substitute the key flavor ingredient, fresh cilantro.

Ingredients

1½ cups dry black beans

1½ cups dry red beans
10 ounces (285 g) corn kernels, fresh or frozen
3 ounces (85 g) (half of a medium) green bell pepper, coarsely chopped
3 ounces (85 g) (half of a medium) red bell pepper, coarsely chopped
4 ounces (110 g) celery (2 ribs), sliced
4 ounces (110 g) red onion, thinly sliced

Dressing
1 tablespoon cumin
½ cup olive oil (or blend of vegetable and olive oil)
6 tablespoons wine vinegar (red or white)
1¼ teaspoons salt
2 cloves garlic, finely minced
2 teaspoons red pepper flakes
¼ cup fresh cilantro, coarsely chopped

Procedure

1. Wash and cook the two types of beans separately, each in 4 cups of water and 2 teaspoons salt until tender but still slightly chewy, about 50 to 60 minutes if unsoaked, about 30 to 40 minutes if presoaked. Drain and cool in running cold water for a few minutes. Drain again, shake all excess water off..

2. Mix beans in a large bowl with corn, bell peppers, celery and red onion.

3. Toast cumin in a small heavy frying pan over high heat for a few minutes until just begins to smoke. Remove from heat and crush in mortar or grind in spice grinder.

4. Mix oil, vinegar and salt and stir until the salt is dissolved. Add garlic, red pepper flakes, cumin and cilantro and blend to a uniform mix.

5. Pour dressing over the beans and vegetables, mix well and let stand several hours or overnight in the refrigerator. Let salad warm to room temperature before serving.

Makes 4 pounds (1800 g) of salad, serves 8 to 12. Keeps well in the refrigerator for 5 to 6 days.

If you live in an area with very hard water, the beans may never cook to a soft and tender stage. Calcium and magnesium, the salts which cause water to be hard, chemically react with some components in the beans and retard the rehydration process. If you have this problem, use bottled or softened water for cooking beans. Adding molasses to the beans keeps them from softening, too, because it contains calcium.

Another important thing to pay attention to is acidity of the cooking liquid. Legumes soften in a neutral cooking environment, and the process speeds up under alkaline conditions. Baking soda (an alkali) accelerates cooking. So, should you add baking soda to speed up cooking? Some people swear it also lessens the negative effects of beans in your digestive tract. I tested the softening effect of the recommended 1/8 teaspoon of baking soda per cup of beans. It shortened the cooking time by about 5 minutes. But for 5 minutes gain it is not worth it. Baking soda actually destroys some of the nutrients (particularly vitamin B) and adversely affects flavor.

While alkalis speed up cooking a little, acids virtually halts it. In acid conditions beans simply refuse to get soft. Here is what happens. The skin of the bean is a carbohydrate that is

held together with insoluble organic substances called pectins. Cooking changes this glue to soluble pectins which slowly dissolve and that is the way beans turn tender. Acid changes the picture. The pectic substances remain insoluble even through long cooking. A mere 1 teaspoon vinegar in the cooking water of 1 pound (half kilo) of beans virtually stops the softening process.

My first attempts at making chili taught me that lesson. I cooked the beans and removed them from the heat while they were still a bit chewy. I figured the further hour of cooking called for in the recipe with the remaining ingredients would allow them to finish softening. I added chopped-up tomatoes, spices, meat, and onion, and continued to cook the chili. When I sampled it an hour later, the beans were still very chewy. The tomatoes made the sauce acidic and the beans stopped softening. Many cooks learned the same lesson the hard way. Any seasoned Southwestern chili cook can tell you that.

This can work to your advantage, too. If you don't want beans to get any softer, for example when you are making minestrone soup, add a little tomato or vinegar when the beans reached your favorite degree of tenderness and continue cooking the soup. The rest of the ingredients will go on cooking but the beans will "hold."

How much water and salt

How much water should you use when cooking beans? Legumes expand roughly to 2½ times their dry volume when fully rehydrated by cooking. If you add more water than necessary, you end up pouring off some of the nutrients. The more the water, the more nutrients leach out. Too much water fades the color out, too. If you cook black beans, for instance, in the least amount of water so there is very little left over when they are done, they retain their purple-black color very well. If you cook them in plenty of water, they fade to a grayish-purple. As a rule of thumb, add 2 cups of water to each cup of dry beans you begin with. As you check for tenderness, you can add a little more if the liquid is too low.

Should you use salt in the cooking water? Some cooks claim that cooking beans in salted water takes more time and they recommend adding salt late in the cooking process. Some even recommend cooking beans without salt. I tested both ideas, and found to be another myth. In the no-salt water, the same beans cooked to just about the same degree of tenderness in the same time as in the salted water. The real difference was in how they tasted. The unsalted batch was flavorless, bordering on unpleasant. Cooked in unsalted water, the natural salts of the beans migrate into the water and are lost. Add ¼ teaspoon of salt for every cup of water you use, and your beans will always taste round, nutty, full-flavored.

Washing and sorting

Then there's the myth of carefully washing and sorting beans to remove any foreign objects. Cookbooks still recommend this step, but modern cleaning methods, using pressurized air, have all but eliminated any foreign particles in packaged beans. But you still have to wash them thoroughly, because dry legumes are not washed before packaging. They store better and longer with as little moisture as possible.

Tips from the chef

It is a good idea to use two or three different-colored beans in varying sizes to provide

texture and color variation in the salad or even main dishes. It takes extra effort but not much extra time. Wash, then cook each kind of bean in a separate pot. They all vary in their cooking time, so don't attempt to cook them in one pot. Cooking them together also mutes the colors. If, for instance, you cook small white navy beans and black turtle beans together, the white beans become a light purplish-gray and the black beans a deadened dark purple-gray. Cooked separately, you preserve their full rainbow of colors and your salad or bean dish will look vibrant, elegant and appetizing.

It is also a good idea to always cook some extra beans. They freeze superbly, and you will have them ready in your freezer to add to soups, salads, eggs, other vegetables, or even to serve as a side dish, should your refrigerator be on the bare side. When defrosted, they are like fresh-cooked.

Points to Remember

- Legumes are highly nutritious with high protein, high fiber and no fat (with the exception of soybeans and peanuts). With complementary grains or corn, they provide complete proteins to the human body.
- To reduce flatulence, soak the offending starch out in hot water, then drain. Serving legumes frequently also helps.
- Always cook your legume, never buy canned or frozen. Once you learn to cook it, it is easy, reasonably quick and tastes better.
- Presoaked legumes cook fast, but if you don't have time to soak, cooking time is still reasonable. If presoaking, allow 4 hours or more.
- Peas and lentils need no soaking.
- Cooking time varies with the hardness of the cooking water and altitude of your kitchen. Cook legumes to slightly chewy consistency for salads, softer for soups, refried beans and other legume dishes.
- Legumes don't soften any further once you add acid ingredient to the dish. Make sure the legume is perfectly tender before you add tomatoes, vinegar, wine or juice.
- Always salt the water when cooking legumes (¼ teaspoon salt/cup of water).

"Cheese is as noble as bread and as
brilliant as wine, and may
the three remain always the greatest
tradition in gastronomy."
"Regard cheese with all the reverence it deserves."
Anna Thomas, cookbook author

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UNSCRAMBLING DAIRY AND EGGS

Egg yolk, parsley and salt


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It is odd that dairy products and eggs are often together like brothers and sisters, even though the animals that produce them are completely unrelated. Maybe it is because they behave similarly over heat and they are both essential food items in any western cuisine. It is also true that they are two of the most complete, most nutritious foods there are. But why did the milkman deliver both dairy and eggs in the old days? Why not dairy and bread, for instance? It probably stems from the historic practice of the farm house-wife being responsible for the milking of the dairy animals and collecting the eggs, but also responsible for marketing the extra.

In most societies today, cow and goat milk are the basis of dairy products. Since nature intended milk to be the full nutrition for the animal infant, it contains everything necessary for both growth and maintenance of health. Eggs are similar in this respect—they provide complete need of nutrients and energy. Both having wholesome qualities make milk and eggs siblings.

UNSCRAMBLING DAIRY

Whether you live to eat or eat to live, you start your life being passionate about milk, your mother's milk. For most people in America this passion for dairy products continues into adulthood. No matter how basic or complex the cooking habits of a household, the refrigerator is likely to contain a dairy product or two. Cottage cheese, yogurt, cheese, milk, if nothing else, there is a carton of ice cream in the freezer. Most of the Asian and African traditional cuisines, however, eliminate dairy products from the menu soon after babies are ready for solid food. In fact, many members of these cultures have a lactose intolerance. Two exceptions are the extensive use of yogurt in Northern Indian cooking and dairy products in many Middle-Eastern cuisines. As you travel east towards Southeast Asia, China and Japan, dairy products become the exception.

How it all Began

The foundation for all dairy products is the basic dairy food, milk. Our ancestors gained milk from the animals they domesticated, first from sheep in the Middle-East 9000 years ago, then from goats 7500 years ago and finally from wild cattle, the first domesticated bovines in Asia, 6500 years ago. We have been using milk or dairy products as food continuously ever since.

Dairy cows first immigrated to America (to Virginia) in 1611, nine years before the Pilgrims arrived on the Mayflower. That makes cows more native than most families we know. Back in the 1800s people had their own cows, and they always had fresh milk available, sometimes still warm from the source. All you had to do was milk the cow regularly and store the milk in a cool place. Raw milk spoils fast without refrigeration, so in the first two centuries Americans had milk during the warmer months of the year only if they owned a goat or a cow. For their continuous supply, even city families often kept a cow or a goat.

The primitive method of getting milk from a cow or any other animal was to squeeze it out from the teats by hand—milking each animal twice a day. As people began collecting more and more in cities, farmers started small dairy farms and milk a whole herd twice a day, then delivering it from house to house in horse-drawn carts. By the 1940s, people had milk delivered to their doorsteps several times a week by milk delivery trucks. You still had to remember to

bring the bottles in soon after delivery, because the milk would sour by the afternoon in warm weather.

Modern technology has changed the dairy industry significantly. Milking machines with rubber fingers took the place of the real human fingers, although the poor farmer still has to get out of bed early to hook them up and turn them on. But today milk flows through sterile hoses directly into refrigerated tanks without ever seeing daylight. From the storage tank it runs with the help of pumps into refrigerated trucks that transport it to milk processors. Once the milk leaves the warm cow body, it is quickly chilled and stays chilled until it goes through the pasteurization process.

Today the U.S. dairy industry provides safe, excellent milk with consistent quality. Dairy cows are much more productive than they were 70 or 80 years ago. In 1920, the average U.S. dairy cow produced 3,138 pounds (1425 kg) of milk a year. By 1950, it was producing 5,314 pounds (2413 kg) annually. Forty-two years later in 1992, the average yield per cow was 15,400 pounds (6992 kg), a five-fold increase in 70 years! With the introduction of the new genetically engineered cow hormone *somatotropin*, Bossy can produce even more milk, an astounding 16,425 pounds (7457 kg) a year or 45 pounds (20.4 kg) a day. That is more than 5½ gallons (21 l) from each cow! Thank goodness farmers don't have to milk by hand any more and carry the milk by the pailful. It would take forever.

Nutrition

Milk contains a large number of proteins, most of them in tiny amounts, but all contribute in important ways to the operation of the human body. These proteins include 60 enzymes that regulate chemical and physical actions. Milk is actually a low-fat food. About 4 percent of whole milk is fat, much less than most meat or eggs and just a little more than lean fish, while low-fat milk only has 1 percent. The fat is mainly saturated, with a smaller amount of monounsaturated and very little polyunsaturated.

Dairy products made from milk vary widely in nutrition and the amount of fat depends on which part of the milk was the basis for that specific product. Processors make many products from the fat part of milk, others from the milk solids, the most nutritious part. (Milk solids are the dissolved salts left behind after all the moisture has evaporated). More fat means more flavor, because many flavor components are fat-soluble, that is, they only occur in fat portion of the milk. Take the fat out and you also take these flavor compounds with it. Butter, cream and cheeses are highly flavored but processors have to add flavor to no-fat and low-fat products so consumers accept them. But all milk products sold in the U.S. are fully nutritious, because by U.S. law they must include at least 8.25 percent milk solids, even with fat removed.

Most cheeses average about 45 to 55 percent fat. Low-fat (fat in the 10 to 15 percent range) and non-fat cheeses are now readily available because many people don't want the fat but like the cheese. Food scientists are busily trying to figure out how to maintain flavor, texture and mouthfeel while lowering or eliminating the fat.

TASTINGS What is lactose intolerance?

Many adult Asians, Africans and Native Americans cannot digest milk. Why? All newborn babies produce *lactase*, an enzyme that allows the digestion of a milk ingredient, *lactose* (also called milk-sugar). After their mothers wean them and don't drink milk regularly, their bodies stop producing lactase, and the ability to

digest milk slows down, then completely disappears. In western cultures children continue to drink milk after weaned, so their bodies keep producing lactase. There are also genetic differences in adult lactase production among different peoples. In people whose bodies don't produce enough lactase, drinking milk causes digestive problems. They have lactose intolerance.

In fermented milk and processed milk products, the fermenting bacteria use up the lactose as their food—people with lactose intolerance have no digestive problems with these low or no-lactose dairy foods. They can also drink *acidophilus* milk to reduce digestive difficulties. Acidophilus is a bacteria *(Lactobacillus acidophilus*) that processors add to the milk that can digest lactose. This bacteria stays inactive in cold milk, but wakes up when you get them in your warm body. It doesn't change the flavor of the milk. The live culture in yogurt also digest lactose. Now enzymes are available that people with lactose intolerance can take that digest lactose for them.

Milk and its Products

Milk

Pasteurizing milk has been an industry-wide standard in the U.S. since the 1940s. Pasteurized milk offers many advantages, even though the full, rich, sturdy flavor of fresh raw milk suffers. It is against the law in almost all of the U.S. to sell raw milk or transport it across state lines. The milk producers must pasteurize, ultra-pasteurize or ultra-high-temperature process milk before they sell it. Raw milk is high in bacteria that reduce its useable shelflife to half or a third compared to pasteurized milk. Even if it is free of bacteria, the active enzymes in raw milk would rapidly spoil it and produce sharp off flavors.

To pasteurize milk, the processor heats it slowly without boiling (boiled milk develops an unnatural cooked flavor). It takes 15 seconds to pasteurize milk at 160°F (72°C), 30 minutes at 144°F (63°C). Pasteurization destroys all pathogenic bacteria, yeasts and molds. But it destroys only 95 to 99 percent of nonpathogenic bacteria, so it is not as sterile as when it left the cow's udder. In practice that means the bacteria count is harmlessly low, but if the kids leave the carton out on the kitchen counter overnight, those few bacteria grow into a real problem. Pasteurization also deactivates those milk enzymes that cause rapid spoiling.

Homogenization is another process all U.S. milk undergoes to keep the tiny fat particles from congregating at the surface (they are the lightest, so slowly they rise), that would turn into heavy cream. The homogenizing process is simple. The processor pumps the milk through tiny orifices under high pressure to reduce the size of the fat globule from very small to microscopic (less than 2 millimicrons). This makes it physically impossible for them to clump together and rise to the surface.

A relatively new process allows you to store milk without refrigerating it. In ultra-pasteurization, they flash-heat milk to 280°F (139°C) for 2 to 4 seconds. Ultrahigh-temperature (UHT) processing is the same, but the processor also packages the milk in sterilized, sealed paper cartons for a shelflife of many months without refrigeration. It comes in handy for

camping, for emergency supplies and for times when you are out of milk in the middle of a baking project. In an experiment food scientists put a labeled carton of UHT milk on a shelf for long-term storage. They opened the carton 2½ years later and compared the flavor with one in a fresh carton. They found no detectable difference in flavor.

Milk has to be pasteurized before it is homogenized. If they homogenized raw milk, the tiny fat globules became easy target for the disabling enzymes, and the milk would turn sour in hours.

The dairy industry has also perfected milk in another form—powdered (dehydrated). That is what they do with the extra milk they cannot sell fresh. Powdered milk keeps well on the shelf for years. Much of it finds its way to developing countries that have a shortage of fresh milk, but it is popular with domestic food processors and commercial bakeries, too. Powdered milk is always non-fat because the fat would oxidize and turn rancid with storage.

You will be surprised to learn that dehydrated milk is not a modern invention. Nomads in the steppes of northern Asia made sun-dried milk at least 1500 years ago. Their diet was predominantly dairy, but milk was both too bulky and too perishable to transport on horseback, so they dried it in the sun and carried the powder in leather pouches. At meal-time they reconstituted it with fresh water from creeks or springs—they had instant milk.

Milk products

In America, you can buy dairy products in grocery stores, delis, even gas stations, in all their many forms. All these choices break into two main categories:

- 1. Uncultured products—butter, cream, half-and-half and ice cream.
- 2. Cultured products—yogurt, frozen yogurt, sour cream, buttermilk and cheese.
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Uncultured milk products

Butter is a common ingredient in most of our cooking. It is absolutely crucial in French baking, in fact, in any French cooking. But the majority of western cuisines also choose butter as the principal cooking fat. Oriental cuisines generally do not. Only Indian cooks use it extensively in its clarified form, *ghee*.

While perishable, butter doesn't spoil nearly as quickly as milk. When Indian cooks remove its milk solids (by clarifying), they don't even need to refrigerate butter. In clarified form its shelflife is as long as that of any vegetable oil.

The major problem posed by butter in our culture today is its high saturated fat and cholesterol content. (The fat in butter is called *butterfat*, a chemically distinct type among fats). Many U.S. households have banned butter from their kitchens with regrets, substituting margarine or oil.

TASTINGS Butter or margarine

Consumption of margarine in the U.S. has slowly increased from the World War II years until the early 1960s, replacing butter. Since then its consumption has been steady. What about France where cooking is unimaginable without butter? Since the mid 1960s both margarine and butter consumption has been nearly steady. But the French eat four times the butter Americans do. They simply will not give up on butter.

How do we obtain our butter? First the milk processor pasteurizes, then ages the cream for at least 8 hours and finally churns it into butter by physical agitation. Aging the cream allows the milk fat to crystallize and weakens the fat globules. The forceful agitation of churning breaks each tiny globule's delicate membrane and allows the globules to clump together into a solid, that we call butter. The churning action expels a byproduct liquid, that the industry calls buttermilk. This is not the kind of buttermilk we drink, it only has the same name.

TASTINGS Butter as an emulsion

Two types of emulsion are common in the kitchen—oil-in-water, as in salad dressing, and cream-and-water-in-oil, as in butter. Churning the cream changes the emulsion from one form into the other. Butter's starting material, heavy cream is an emulsion of oil-in-water. After churning it becomes an emulsion of cream-and-water-in-oil—just a physical change.

After the cream becomes butter, it goes through washing and then a mechanical manipulation (something like kneading bread dough) to reduce the size of the fat crystals. This makes it softer and more spreadable. Butter oxidizes (turns rancid) at room temperature relatively fast. Chilling slows down the oxidizing process. Antioxidants would help reduce rancidity, but U.S. law restricts adding anything but salt and a coloring agent to butter. Salt extends its shelflife, coloring enhances its appearance.

TASTINGS From cream to butter

One gallon (3.8 l) of cream containing 40 percent fat produces 4 pounds (1800 g) of butter and a little over 2 quarts (1 l) of buttermilk-like liquid. They don't waste the leftover liquid. The dairies condense it down to 25 percent into a syrupy liquid which they use in other dairy products to enhance flavor and add richness, for instance, in ice cream.

Salting butter is a habit left over from the days before refrigerators. By the time refrigeration was common, people were used to the flavor of salted butter, and processors encouraged its use because it extended the shelflife. The amount of salt they use in butter is 1.5 to 1.8 percent (about 1¾ teaspoons in a pound or 450 g). The most common coloring agent is annatto, a natural reddish-yellow dye. Without coloring, most butter is too white to look like the real thing. The natural color depends on what the cows, who produce the cream, eat so in some seasons they must use coloring to boost the yellowness—or consumers start complaining.

What Butter is Made of:

Substance	**Weight in %**
Fat	80-84%
Water	15-16%
Milk solids	1%
Salt (if salted)	1.5-1.8%

That 15 to 16 percent water you see in the table is the reason butter sizzles when you heat it in the sauté pan. The water boils in the hot pan, turns into steam and tries to escape from its

covering blanket of fat. The bubbles of steam pop and they make a symphony of sound that we hear as sizzle. Oil, lard and vegetable shortening never sizzle in a hot pan because they are free of moisture.

Don't confuse unsalted butter with sweet cream butter. The sweet cream label refers to the fact that they started the churning process with sweet instead of soured cream. North American processors don't use soured cream to make butter, but the French and several other Europeans do as consumers prefer it. They let the cream sour slightly before churning it. The difference in flavor between the two types of butter is slight—the European style has a slight tanginess. No one knows why we still retain the outdated term sweet cream butter, but it has nothing to do with its salt content.

Butter blends and dairy spreads are a combination of butter and vegetable oils. Mixing oil in butter reduces the price since oil is far cheaper than butter, but it also reduces the cholesterol while maintaining some butter flavor. Don't be fooled—total fat and calories remain about the same. In low-fat spreads, water replaces some of butter's fat, reducing not only fat but calories, cholesterol and flavor.

TASTINGS Blend your own cream
If you have heavy whipping cream and any type of milk in your refrigerator, you can make any of the in-between creams, such as light cream or half-and-half. Use your high school algebra to figure out the proportions of each you need to arrive at a cream with a certain amount of fat content. The amount of fat in the milk and heavy cream appears on the containers.

Other uncultured milk products

Products	% fat	Remarks
Heavy (whipping) cream	min. 36%	Whips to highest volume with ease, firmest, holds foam best. Avoid ultra-pasteurized that doesn't whip as well.
Whipping cream (light)	30-36%	
Light cream	18-30%	Doesn't whip well. Used for toppings, soups, cereals, coffee. Not generally available.
Half-and-half	10.5-18%	Most popular for coffee, cereal, dessert toppings, cooking.
Ice cream	Highly variable	See Dessert chapter for useful information, interesting facts.
Clotted cream	55-65%	British invention, not much used in America. Very heavy cream heated slowly for several hours, then chilled slowly. Almost like eating butter.

Margarine

Margarine is not a dairy product but since so many people substitute margarine for butter, this is a good place for its discussion.

A food scientist in France, H. Mège-Mouriès, developed margarine in 1869 as a substitute for butter in case of unexpected dairy shortage. He produced it by churning together high-quality beef fat, called suet, and milk, but production was limited because of shortages of

suet. In 1902 W. Normann, a German scientist improved on the technique, and was able to bypass suet and harden oil with the addition of hydrogen (this is the process called *hydrogenation)*, which changed liquid oil into a solid fat that we know as today's margarine.

Margarine is mainly oil and water. The processor uses huge hydrogenation converter drums with a nickel catalyst at 200°C (392°F) and violent agitation in contact with a flow of hydrogen gas. Then they cool and filter the resulting margarine to remove traces of the nickel catalyst.

2. Cultured milk products

All cultured (also called fermented) milk products have varying amounts of lactic acid, which gives them their pleasingly tart, slightly tangy flavor. There's a difference between milk product fermentation and yeast fermentation that some people confuse. Milk product fermentation is by bacteria that produce lactic acid, while yeast (a completely different microorganism) convert sugar to alcohol in such things as bread dough, brewing beer and wine.

Product	Remarks
Yogurt	Two different cultures of lactic acid-producing bacteria ferment it. May start with whole, low-fat or non-fat milk. Fermented to 0.9% acidity (pH 4.4). Slow fermentation at cooler temperature results in smoother, creamier texture, more costly product.
Sour cream	Two sets of live cultures added to light cream. One culture ferments, second culture produces flavor. Fermented to 0.5% acidity.
Buttermilk	Same culture ferments it as sour cream but instead of cream, low-fat milk is used. Fermented to 0.8% acidity.

Today's yogurt comes in mind-boggling array of flavors. Processors add fruit purée or fruit syrup (15 to 18 percent) either leaving it on the bottom of the container before culturing (sundae-style) or they quickly blend it into cultured yogurt just before chilling (Swiss style). Stabilizers, that also thicken it, make up about half a percent of commercial yogurt.

You can get fooled into thinking that nonfat yogurt is your perfect diet food, but the high sugar content ups the calories considerably. The amount of sugar ranges from 7 to 15 percent, but in some brands it is as high as 25 percent, twice the amount than in a can of soda. If your goal is diet food, you are better off to buy unflavored yogurt, then add your own sweetener or flavorings.

Frozen yogurt is simply Swiss-style yogurt that the processor quickly freezes. It comes in packages like ice cream and you serve it like ice cream.

Other cultured products less commonly available are sour half-and-half, which is a lower-fat sour cream, and *crème fraiche*, that cooks use like cream in French marinades or sauces, where they prefer a thicker consistency and slightly tart flavor. Crème fraiche is easy to make at home. Start with heavy cream, inoculate it by adding a little cultured sour cream or buttermilk, and let the mixture ferment for a day at room temperature until thickened. The result is just barely sour, with about 0.2 percent lactic acid.

Two interesting cultured products that never made it to North America are *kefir* and *koumiss*. Both of these originated with the nomads in the Steppes of Central Asia around the year 1000. The kefir you find in health-food stores is a beverage that bears no resemblance

whatsoever to the original, only the name is the same.

In both kefir and koumiss, two cultures ferment simultaneously, a lactic acid-producing bacteria and an alcohol-producing yeast that live in symbiotic relationship. The result is a sour, tangy alcoholic beverage that Russians and some Eastern Europeans are very fond of. It fizzes like beer and is mildly intoxicating. The alcohol content is fairly low, ranging from 1 to 2.5 percent, much lower than beer. The acid content is 0.7 to 1.8 percent, quite a bit more tart than our yogurt. The difference between kefir and koumiss is what they begin with. They produce kefir from cow, goat or sheep milk, and koumiss from mare's milk (though originally, before horses, the nomads used camel's milk). Large herds of mares graze peacefully in Russia like cows in Wisconsin, and farmers on these horse dairies get up as early as Wisconsin farmers do to milk their herd of horses. Due to shortages of mare's milk now, some Russian processors switched to cow's milk to make koumiss. Even if they use cow's milk for both koumiss and kefir, different live cultures produce the two, and they taste different. There's nothing like a six-pack of ice-cold koumiss on a hot summer day!

Natives in the Himalayas use another fermented milk drink similar to kefir called *airan*. They make this from the milk of *nak* (the female companion of a *yak*). It is hard to find airan in North America, but it is supposedly an unusual-flavored, somewhat fatty beverage that takes acquired taste buds to love.

And of course, cheese

Cheese is one of the top favorite American foods and dieters find cheese the most difficult item to trim back from their menus. In the late 1990s, Americans eat an average of 28 pounds (12.7 kg) of cheese per person annually, excluding cottage cheese, or 1¼ ounces (35 g) every day, twice the amount they ate in 1972. That sounds like a lot, but a fair amount of this is as mozzarella cheese on our favorite pizzas. Because of the number of pizzas we gobble up, mozzarella is the second favorite cheese after cheddar.

All cheeses, except for unripened kinds, are fermented milk products. Unripened cheese (also called *green cheese*) has little flavor because it is the fermentation that produces the flavor compounds. Cottage cheese and ricotta, two familiar examples of unripened cheeses, are both mild and pretty bland by themselves.

The fermentation of cheese is not the same process as yogurt, buttermilk and sour cream fermentation, although it also starts out with lactic acid-producing bacteria. Lactic acid fermentation is only the first step, and the original bacteria don't define the final product's flavor or texture. They only coagulate the milk, a minor role. Cow's milk is the usual starting material for cheese, because it is the most widely available and cheapest. But where plentiful, they use goat, sheep, mare, nak and buffalo milk.

Cheese production is truly ancient craft, dating back 8000 or 9000 years. It most likely developed in several parts of the world at the same time, but it was the Romans who raised cheese making to an art, and introduced it into countries they conquered. Today there are at least 450 recognized varieties of cheese. Some of these are essentially the same with different names that designate towns they are made in, or they are given different names for different shapes.

How they make cheese

The basic chemistry of cheese making is extremely complex. Even cheese scientists don't

understand all of it. The starting material is always milk to which they add either bacteria or *rennet*. Rennet is a substance found in the stomachs of some unweaned animals and cheese makers usually employ the most-commonly available calf rennet. It contains the enzyme *rennin*, that coagulates milk. Shortages of rennet spurred biotechnologists to genetically engineer the enzyme in the laboratory using bacterial fermentation. The U. S. Food and Drug Administration approved the use of genetically engineered rennet in 1990, and it has been in use ever since. Today about 60 percent of all our cheeses are produced by genetically engineered rennet.

Whether by bacteria or rennet, lactic acid forms from lactose (milk sugar), as the heated milk coagulates. As a result, clumps of soft, jelly-like curds appear. Bacteria produce curds in anywhere from 5 to 16 hours, while rennet produces curds within 15 to 30 minutes. Obviously, the cheese industry prefers the considerably faster rennet. The liquid left over after the curds form is the whey.

Many vegetarians refuse to eat cheese made with rennet because it is an animal-derived product, referring to the fact that the animal had to die to provide the rennet. Their stand is uncertain at this point because genetically-engineered rennet is so widely used in cheese making. But health-food stores regularly sell more costly rennet-free cheeses, that had bacterial coagulation.

TASTINGS The discovery of rennet

Curdling by rennet must have been discovered in ancient times, probably by the Central Asian nomads who survived mostly on a dairy diet. They carried their fresh milk in leather pouches made from animal stomachs. Someone one day must have used the stomach of an unweaned calf. What a surprise they must have had the first time they opened their pouch for a refreshing drink, only to find that it had turned into solid chunks floating in whey (that didn't taste too bad).

Here is a brief synopsis of how cheese-makers produce cheese once they have the curds:

1.First they gently cut the curds with huge sets of knives or steel wires to increase the surface area. This speeds up the expulsion of the whey. Then they slowly cook the curds at low heat to drive out even more whey. Heating of the soft, semisolid mass also gives it an incipient texture, reduces moisture and kills harmful bacteria.

2. Next they drain off as much whey as possible through strainers, and they place the curds into containers that form the final huge cheese blocks shapes. They leave these to rest or, as they call it, to knit. This allows the lactic acid to develop the characteristic texture of the particular cheese and helps to further reduce moisture.

3. After resting they sprinkle salt over the surface of the cheese blocks. This further helps to develop texture, improves the appearance and draws out even more moisture. Salt also checks lactic acid fermentation, suppresses the activity of harmful microorganisms and contributes to the final flavor.

4. But they still have to get rid of more moisture. They press the cheese blocks by heavy weights or by mechanical pressure between 6 and 18 hours, which drains more trapped whey. How much pressure they apply and for how long varies from one kind of cheese to another. At this point, they still only have solid blocks of salty, faintly milk-tasting flavorless cheese.

5. The last important step, ripening (also called aging), is what really develops the true flavor of the cheese. Ripening progresses simultaneously on two levels. Live bacteria work on one level and enzymes on the second. They both produce different flavor chemicals, and those

combined develop and define the cheese's final flavor. Before the ripening begins, the cheese-maker introduces the microorganisms, and either also adds the enzymes or let those that still remained in the curd do the work. Together they break down fat, protein and the remaining lactose (the part not yet converted to lactic acid). Enzymes actually don't take part in the ripening process directly but speed up (catalyze) reactions. Without them the process would be much slower, and the resulting cheese less affordable.

A lot of different flavor compounds contribute to the taste of a good cheese. Some flavors develop from the action of the fermenting bacteria, some from the action of the enzymes and some from still other enzymes released by bacteria after they die. The process takes from 2 months to 2 years at an ideal temperature specific for each cheese.

The longer the ripening process, the better and sharper the cheese, and the higher the price. Compare the amount of flavor in a mild fontina aged for 3 months to that of a sharp romano that has been aged for at least 8 months. Extra-sharp cheddar is aged for well over a year, and each extra month of aging adds to the price. This is partly due to the cost of storing, but cheese also continues to lose moisture and weight, so there's less to sell. It takes 100 pounds (or 100 kg) of whole milk to produce 9 to 9.5 pounds (or 9 to 9.5 kg) of moderately aged cheese, but will only produce 8.5 to 8.8 pounds (or 8.5 to 8.8 kg) of a well-aged cheese.

Local and regional preferences dictate how long they let cheeses age. The French, for example, prefer their cheeses well-aged, the Americans much less so. Cheeses imported into the U.S. from France are milder than the equivalent cheeses sold there. Regional tradition determines the color of some cheeses, too. Northeastern U.S. cheese eaters, for instance, prefer their cheddar white, while the rest of the country eats yellow cheddar. The cheese-maker usually also adds color. The natural color depends not only on the color of milk but the aging process, and it may not be acceptable to consumers.

Most unripened cheeses, for example, cream cheese, mozzarella, ricotta and cottage cheese, are relatively inexpensive because their processing is less extensive and no aging is involved. The cheese-maker only homogenizes cream cheese, while he washes and creams cottage cheese and ricotta. There is neither bacteria, nor enzymes in the process.

How they classify cheeses

Finished cheeses are in two broad categories, fresh (or unripened) and aged. Fresh cheeses contain much more water than aged varieties. For instance, 80 percent of ricotta and cottage cheese is water. These are the most perishable cheeses, and they need refrigeration at all times. Generally, the more moisture and less fat in a cheese, the more hospitable the bacteria find the environment.

Aged cheeses are in four groups:

1. **Soft**, aged by bacteria alone (like feta), by the joint action of bacteria and surface microorganisms (like liederkrantz) or by surface mold (like brie). These are all high-moisture, perishable cheeses with water content of 50 to 75 percent.
2. **Semisoft**, aged by bacteria (like gouda), by bacteria and surface microorganisms (like brick) or by interior mold (like blue cheese). These cheeses are also fairly perishable, with a 40 to 50 percent water content.
3. **Hard**, with eyes (like Swiss) or without (like Colby), all bacterial aged. The water content is 30 to 40 percent. These cheeses should be refrigerated, but they are not nearly as perishable as soft and semisoft varieties.

4. **Very hard**, (like parmesan) contain 30 percent water or less. They are bacterial aged. Because of the relatively small amount of moisture, these cheeses remain stable at room temperature. For longer shelflife, it is still best to refrigerate them.

Processed cheese

One cheese is in a category of all its own—pasteurized processed cheese, a truly American invention that enjoys great popularity because of its unobtrusive, almost bland flavor, great versatility, long shelflife and low price. Processed cheese is a combination of several cheeses in which the processor blends cream, water, salt, emulsifier and coloring. The next processing step is to grind up and blend the cheese, then pasteurize and package it. Thanks to pasteurization, this cheese has a very long shelflife (measured in months) and stable flavor.

In the 1990s cheese processors have developed new processed cheeses that are in an entirely different, higher class. Made from a combination of good-quality, flavorful cheeses, they have a very respectable taste, and only the smooth, slightly soft texture and its label give them away as processed cheeses.

Here is a final note on a special kind of processed cheese, called *filled cheese* (or cheese analogue). The food processing industry uses a great deal of it because it is inexpensive, has extra-long shelflife and still has cheese flavor. In filled cheese they replace the original milk fat with lower-priced vegetable oils or other fats, otherwise processing follows the usual cheese making steps. The manufacturers of packaged foods use most filled cheese in lower-priced cheese-like foods, on prepared sandwiches, in frozen pizzas, in cheese sauces and as extenders of more costly natural cheeses in the food service industry. They have poor flavor compared to natural cheeses, even processed cheeses, but their keeping quality is excellent. They also have less cholesterol and calories than real cheese. It is not for cheese-lovers but for people on low food budgets.

How Dairy Performs in the Kitchen

All of the 60-odd proteins in milk fall into two categories. In one group they precipitate either in acid or on heat, and in the other they remain in solution. This is an important distinction in the kitchen that asks for some clarification.

Milk and acid

In its natural state, milk is very slightly acid (pH 6.5). One protein, *casein*, which makes up 80 percent of all milk proteins, precipitates in mild acid conditions but natural acidity is not acid enough. When milk starts getting old, bacteria produce lactic acid, the milk becomes mildly acidic (turns sour), and casein precipitates as curds. If you let the milk sit longer, with more lactic acid it becomes more acidic, and another group, whey proteins, also precipitate, and even more curds develop.

If you add anything quite sour like citrus juice, vinegar or tart fruits, the milk curdles instantly as the casein precipitates. Sometimes we do this deliberately, making custards with fruit juices or fruits, for example, but the soft curds will disperse when slowly heated in the oven, and add firmness to the custard. Most of the time, you don't want milk to curdle. To prevent this, mix starch (in the form of flour, cornstarch, tapioca) with the acid ingredient. Starch keeps the casein

in suspension, and prevents curds from forming.

Milk and heat

A common problem when heating milk is how easily it scorches on the bottom of the pan. The thinner the pan and the higher the heat, the more scorch you have to scrub off. What happens is that the heat precipitates heavy proteins in the milk that sink to the bottom, and burn on the hot surface of the pan. What can you do? Heating the milk in a double boiler works, because there's no direct contact with the hot metal surface of the outer pan, but it takes forever. Constant stirring keeps the proteins from settling on the bottom, but this also takes time and attention. Try heating milk at a bare medium heat while occasionally stirring. This at least minimizes the pot scrubbing afterwards.

The other common problem with heating milk happens on top. A skin forms on the surface of the milk as it heats, and if you are not watching it carefully, the milk boils over. The two events, bottom scorching and top skin, are connected. Heat precipitates proteins and calcium. The heavy casein sinks to the bottom while the light proteins and calcium precipitates rise to the top and form the skin. The skin in turn creates a tight seal over the upper surface of the milk all the way to the sides of the cooking pot. The air bubbles that form below the skin in the liquid cannot escape, so they accumulate as steam, which lifts the skin up like a hot-air balloon. The next thing you smell is the erupting milk pouring down the outside of the pot and onto the burner. When you see the skin forming over the surface, stir it back in the milk to prevent it from boiling over. Don't skim it off, or you lose valuable nutrients.

You can buy a ceramic disk (size of a tuna can and thickness of a finger) that sits on the bottom to prevent boil-overs. It has a clever design, that allows air bubbles to collect below the disk and are released in big pockets instead of many tiny bubbles. These large bubbles stir the milk enough to keep the skin from forming. This stirring action also helps with the bottom scorching problem.

Scalding milk

Why do some recipes call for scalded milk before using it in baking? You see these particularly in older cookbooks. This was an essential step before pasteurization to deactivate enzymes in the milk that interfered with the action of other ingredients, like yeast. Scalding is no longer necessary because pasteurization deactivates the offending enzymes. In some recipes it is helpful to warm the milk to speed a process, such as activating yeast, or starting with warm liquid in custards and puddings. But if you need to scald milk, heat it to near boiling. Tiny bubbles on the surface are your trigger. If you actually boil the milk, the flavor becomes insipid. (Note, however, that heating milk to make yogurt has a different purpose. Heating here is to destroy all competing microorganisms before adding the bugs that culture the milk.)

How to whip cream

Many cooks reach for the aerosol can filled with whipping cream in the market's refrigeration section when the shopping list says "whipped cream". What a shame! If they tasted the difference just once between that very convenient dispenser can and the so much less convenient whip-yourself heavy cream, they would never sacrifice convenience for flavor.

Whipping cream in your kitchen takes time and doesn't always work (occasionally creams stubbornly refuse to whip for unknown reasons). Yet, like everything else in cooking, knowing a few key points is the secret of getting a wonderful-tasting, calorie and cholesterol-rich, long-lasting, firm, billowing whipped foam.

1. Choose pasteurized, not ultra-pasteurized, cream, if available—it whips faster to better foam. Creameries ultra-pasteurize cream for longer shelflife (not for your convenience).
2. Make sure you buy heavy cream or whipping cream. If the carton is labeled cream, it is probably not rich enough for whipping into a good foam, though if you are watching calories, it'll whip into a perfectly respectable but lighter whipped foam.
3. Whipping cream must be very cold to work well. The complex physical action of whipping air into the cream only works if the fat globules of the cream remain firm. Once they warm up even to 50°F (10°C), the fat globules cannot hold much air, you get less volume. If its temperature is close room air, it simply doesn't whip into a very firm consistency.

Chill not only the cream but the beater and bowl as well. Refrigerator temperature is fine, though some cooks put both bowl and beater into the freezer for 5 minutes. That is not necessary except in a hot kitchen. If the kitchen is too warm when you whip the cream, you are whipping the warm kitchen air into the cream and raising its temperature. Sometimes we don't have a choice besides a hot kitchen but if possible, consider moving your beater to the coolest location in your place. Beating over ice-water is also possible if you can devise a system to do it.

We often need sweetened whipped cream. Never use icing sugar in the cream. Icing sugar contains cornstarch that interferes with whipping. Use regular granular sugar that you add early in the whipping process. Use no more than 2 tablespoons sugar for every cup of cream.

For a firmer, longer-lasting whipped cream some professionals add a small amount of gelatin. Here is how to do it (thanks for help from the United Dairy Industry Association):

1. Sprinkle 1 teaspoon gelatin over 3 tablespoons cold water in the smallest bowl you have. Let it soften and absorb water for a minute, then place the bowl in a pan of very hot water while stirring the mixture until you see no trace of the gelatin.

2. Let it cool to room temperature. (Don't wait too long before adding it to cream or it starts setting sooner than you want.)

3. Whip cream to soft peaks then gradually drizzle in gelatin mixture while continuing to beat at medium-high speed.

This amount stabilizes 1 to 1½ cups cream. You can keep this whipped cream in the refrigerator for days without leaking.

Clarified butter

What is clarified butter? It is butter from which you remove the milk solids. All that remains is fat. French and (Asian) Indian cooking often call for clarified butter, but American and other cuisines don't use it much. The advantage of clarified butter is that it doesn't spoil. It remains liquid at room temperature like any vegetable oil. It is also just as stable as most oils, but still retains much of its wonderful butter flavor because flavorings in butter remain with the fat. Indian cooks prepare clarified butter, they call ghee, by the gallons and keep it on their shelves for months. It doesn't burn over high heat like butter does, so you can even deep fry in it. The disadvantages are that it takes an extra step to make it, it retains all the cholesterol and it costs much more than vegetable oils.

To clarify butter, melt it over low heat, skim off and discard the scum that forms on top, remove the pot from the heat, and let the solid sediments settle for a few minutes to the bottom. Pour off the clear liquid that is now the clarified butter. It is pure fat that has changed to liquid oil. Discard the solids (that is the milk solids) remaining in the pan. One pound (450 g) butter gives you 12 ounces (340 g) of clarified butter.

Unsalted butter

Many recipes specify unsalted butter—supposedly its flavor is better than salted butter's. This is true. Since it is more perishable than salted butter, its shelflife is shorter and retail stores keep it for a shorter period, thus it remains fresher. When you use unsalted butter, you can control how much salt is going into your batter or cooking pot. You cannot tell for sure how much processors have added to the salted kind. Usually it is 1.5 to 1.8 percent, which translates to about 1¾ teaspoons salt in a pound (about 4 teaspoons in a kilo) of butter. If you prefer the salted flavor, you have a better deal buying unsalted butter and sprinkle salt over the butter on your bread or in your cooking.

Heating cheese

There is an enormous variety of cheeses, and their cooking behavior also varies widely. As a general rule, expose cheese to heat for the shortest time possible. In many dishes the rule is: just until melted (if the cheese is part of the dish) or until melted and slightly browned (if sprinkled on top). Overcooking cheese breaks it down and separates it into a stringy mass floating on an oily soup. What happens is that the main milk protein, casein in the cheese coagulates and separates from the liquid, which is water and melted fat. This process is curdling, a bitter enemy of cooks.

Soft, high-moisture, barely-aged cheeses are particularly susceptible to curdling. Their protein that curdles is casein, that hasn't been broken down much by aging. In hard, well-ripened cheeses, the casein is in smaller pieces that coagulate less readily. Whenever you are adding cheese to other hot ingredients, continue to heat it carefully and with constant stirring, because you can break down casein even after you've fully incorporated the cheese with other ingredients. The more cheese in the concoction, the more careful you need to be. Once casein is broken down and the cheese curdles, you cannot reverse the process. The flavor doesn't suffer, however, so if the dish is not unappetizing, unsavory-looking you can still serve it and enjoy it. Don't mention it to anyone and no one is likely to notice it.

To minimize curdling, use grated or finely-chopped cheeses when cooking. The smaller the individual pieces, the faster they melt. In many dishes you don't even need to heat the cheese. If you add cheese to a hot dish, the heat of the dish may be enough to melt it smoothly.

Adding starch to the dish—cornstarch or flour—along with the cheese prevents curdling for some reason that food scientists haven't yet figured out.

You may also have had problem with cheese turning stringy on cooking. This is due to a chemical, calcium phosphate, that some cheeses contain. This substance links the already long protein molecules together to form even longer strings. To prevent stringy cheese in a cooked dish, add a squeeze of lemon juice to the cheese before stirring it into the hot food. The citric acid binds with the calcium phosphate and prevents the formation of long interlinked molecules. Wine does the same but not quite as effectively. Your cheese fondue with white wine shouldn't

turn stringy.

Swiss cheese schnitzel

Schnitzel in German and Austrian kitchens means a thin slice. The schnitzel common in American cookbooks is wiener schnitzel, a thin slice of breaded veal cutlet quickly sautéed in hot fat. This Swiss cheese schnitzel is just like a wiener schnitzel but instead of veal we bread a thin slice of cheese. It is a different way of serving cheese hot for lunch, dinner or even breakfast. Quick and easy to prepare, it can go from stove to the table in 5 or 6 minutes. It is something like a grilled cheese sandwich, but you serve bread on the side, and browning the cheese by itself adds the full, rich flavor of the browning reaction.

You can prepare the slices ahead of time and place them from the refrigerator directly into the hot oil just before serving. Make sure to watch closely, so the cheese doesn't melt much. As soon as it starts oozing noticeably, flop each on a plate and serve.

Ingredients

1 egg, beaten
1 teaspoon ground chili (mild, medium or hot)
3 tablespoons parsley, finely chopped
4 slices Swiss cheese, about 2 ounces (55 g) each
½ cup dry bread crumbs
2 tablespoons vegetable oil
2 tablespoons butter

Procedure

1. Add chili and parsley to the beaten egg and mix well.
2. Pour the egg on a shallow plate. Spread bread crumbs on another plate.

3. Dip cheese slices into the egg mixture, let excess drip off, lay in bread crumbs, then turn and coat the second side. Make sure bread crumbs cover cheese well. Shake off excess crumbs and you have a cheese schnitzel.

4. Heat the oil-butter mixture in a heavy, large sauté pan over medium to high heat. When it starts to bubble, slip in the cheese schnitzels and brown quickly, no more than 2 minutes per side. As soon as the cheese begins to melt, turn the slices over, brown a minute on the other side and serve. (Some cheeses melt faster than others.) Garnish with parsley sprigs and lemon or lime slices.

Fresh, crusty French or Italian bread, pickles, hot or cold vegetables or fruit go well with this creation.

Serves 4.

Cheese flavors

When serving a good, ripe, well-aged table cheese fresh, always remember that the best flavor bouquet opens up fully at room temperature. To be exact, even if the cheese is not ripe, barely aged, and just mediocre, letting it warm up may improve it to acceptable. Let the well-

wrapped cheese sit on the counter for anywhere from 1 to 4 hours depending on how warm your kitchen is. The change is surprising. To see for yourself, cut a piece of cheese in two. Wrap them well, return half in the refrigerator and put the other half on the kitchen counter for a few hours. With a good, well-aged cheese you can immediately tell the difference. Unripened cheeses, on the other hand, develop only spoiling bacteria when you leave them at room temperature for any length of time.

Storing Dairy Products

The more water a dairy product contains, the more perishable it is. The more aged and processed the cheese is, the better it keeps. Bacteria need high moisture to thrive and they spoil milk, cream and high-moisture cheeses with pleasure and expediency. As we already know, milk curdles when we add acidic foods, but it also curdles naturally without your help if you give it time. Lactic acid-forming bacteria build up the acidity slowly if the milk is cold, but they multiply fast, complete the job and curdle the milk within hours at warm room temperatures.

Milk freezes well. If you have too much milk on hand, pour it in plastic containers, self-sealing bags or store it in its original carton in the freezer. It keeps well for 2 to 3 months and tastes fresh and remains lumpfree when defrosted.

Butter is moderately perishable, but it is notorious for picking up odors from other things around it. Never store it in the refrigerator uncovered even for short-term storage. What actually makes butter spoil is oxidation, caused by exposure to both light and air which turns it rancid. Wrapping it tightly in foil instead of the waxed paper it comes in almost doubles its shelflife. You may have noticed that better-quality butters are often foil-wrapped.

Refrigerated unsalted butter has a shelflife of a few weeks. Butter freezes well and it stays good for several months in the freezer. Salted butter lasts at least three times longer in both the refrigerator and freezer without deterioration. When defrosted, you cannot tell the difference in flavor or texture.

Freezing, on the other hand, separates cream. It breaks down the emulsion, so the fat separates from the water. But if you freeze it very fast, the emulsion stays intact. If you have extra cream that you want to freeze, take a clean baking sheet, chill it thoroughly in the freezer and pour a thin layer of cream on it. Freeze it, then scrape the frozen cream into a plastic container or plastic bag. After defrosting you can even try to use this cream for your coffee.

Whipped cream freezes very well. Put dollops of whipped cream on a sheet of waxed paper laid on a baking sheet and freeze them for an hour. Then collect these individually quick-frozen dollops in a plastic bag to store in the freezer. You can use them as freshly whipped cream after defrosting. Freezing preserves its structure virtually intact.

High-moisture cheeses keep for several weeks, lower-moisture hard cheeses at least twice as long, even several months when you store them properly. The less you touch the cheese, the fewer bacteria you transfer to its surface, and the longer the shelflife. Handle freshly-opened cheese only with clean hands. Wrapping cheese well to eliminate both microorganisms and oxidation extends its shelflife, too.

When surface molds attack stored cheese, don’t throw the whole piece out. They are not harmful, just disgusting looking and tasting. Scrape or cut off a thin layer, and the cheese beneath it is still perfectly good to eat. But once a piece of cheese is heavily coated with mold, scraping is not enough. The moldy flavor may have permeated the entire chunk.

Dry, low-moisture, well-aged cheeses, such as romano and parmesan are stable even

without refrigeration. But if you are planning to store them for several months, you should keep even these cheeses chilled to reduce the rate of oxidation, thus rancidity.

Ripe, well-aged cheeses continue aging even in storage, though slowly at refrigerator temperatures. Storing them too long allows them to overripen, their flavor gets unbalanced and too intense. Often these cheeses, like brie, come in a wrapping something like waxed paper, but if you look closely, there are tiny holes all over the wrapping (called microperforated packaging). These tiny holes let the cheese breath while ripening. Aging produces excess moisture that you want to release to prevent spoilage. Don't rewrap these aged cheeses in plastic wrap. Use the original wrapper or kitchen waxed paper.

TASTINGS Saanen and hákarl

An old custom in some regions is to keep selected, well-aged cheeses for special occasions for years. If well-wrapped and protected from oxygen, they will remain in good condition for a long time. The Swiss have a tradition of keeping a low-moisture cheese called *saanen* to celebrate anniversaries, births, weddings and other festivities. People in Iceland also have a curious "cheese" called *hákarl*. They bury Greenland shark in the permafrost for a long time to let it slowly, naturally decay and ferment. When it is ready, they dig it up and serve it like brie. I haven't heard a report on its flavor.

Don't freeze cheese if you don't have to. Freezing doesn't affect flavor, but you destroy its texture, and it turns mushy after thawing. It is perfectly fine in any cooked dish, since it still blends well with other ingredients. If you need to freeze excess cheese or just want to have some for cooking in the freezer, grate it first then store in labeled freezer bags. That way you can use small amounts at a time when you need it.

UNSCRAMBLING EGGS

Egg Basics

Chicken or the egg?

Stealing eggs from bird nests had to be one of the original sins. Early food gatherers had easy access to few ready-to-eat foods. Fruits, vegetables, nuts, seeds, honey and grubs were the most obvious, but eggs were everywhere, too. Bird, snake, lizard, tortoise and turtle eggs, as long as they were large enough, had the advantages of being both easy to steal and nutritious. Emu and ostrich eggs must have been the undeniably best prize for the food gleaners.

The domestication of chickens 4000 years ago gave an added perk of having not only meat but eggs. This built-in egg factory in every back yard made them available to most human beings. Virtually every culture and cuisine includes eggs as food. Even most vegetarians eat them. The only religious taboo is in Buddhism that does not believe in killing an incipient creature even for food. A strict Buddhist only eats eggs which had cracked, thus no longer a potential source for life. While living in Sri Lanka, I bought eggs in the pharmacy (I never figured out why they sold eggs in the pharmacy). There were two boxes by the cash register, one

holding uncracked, wholesome eggs, the other had eggs with cracked shells which cost more because in Sri Lanka there was more demand for them. I always opted for the cheaper eggs with uncracked shells.

It was serendipitous that our Asian ancestors chose chickens for domestication, the descendants of a wild Indian jungle fowl *(Gallus domesticus)*. Birds lay eggs in two different patterns. In one pattern the bird lays a number of eggs in quick succession, then proceeds to incubate them at once. The other pattern is slower, usually one a day, until a certain number accumulates in the nest. The chicken, fortunately, is in this slow-laying group. She doesn't start sitting on the nest to warm the eggs and initiate the development of the embryos until the nest is full. It didn't take humans long to figure out that if they remove the new eggs every day or two, the hen will continue to lay more, trying to fill up the nest. No one knows for sure how a chicken "counts her eggs before they are hatched," but she keeps laying an egg a day in her single-minded effort to fill up the nest.

Early Americans introduced chicken flocks into the New World in 1607 in Jamestown, Virginia, the first permanent English community on the continent. Farmers' wives soon took over the raising of chickens and the gathering and selling of eggs. "Egg money" belonged to the wife, and she could spend it any way she chose.

The modern eggs

Virtually all western cuisines use eggs as essential ingredients, particularly in baked sweets. It was the French who discovered eggs' versatility in cooking and baking, and French chefs perfected their use as culinary artists with unbelievable applications. The French cuisine without eggs (and butter) would collapse instantly. Eastern cuisines, on the other hand, use eggs very little, as they don't include baking in their culinary repertoire. They don't care for egg-based sauces or mayonnaise-type emulsions. If they do use eggs, it is in simple forms as in egg curry, egg-drop soup, stir-fries and custards.

Chicken eggs are by far the most-used eggs for cooking and baking. Their chemical composition makes them ideal for virtually all cooking purposes. Duck eggs are much less versatile. While better for baking cakes or cookies with their rich, large yolks, their whites don't whip up well.

Young hens, called pullets, begin laying eggs at the early age of 20 to 22 weeks and continue laying until the ripe old age of 75 weeks (less than a year and a half). On the average, they lay 270 eggs in their one-year egg-laying lifetime. As hens age, the eggs they produce keep shrinking both in size and frequency, signaling the rancher it is time to move them into their next job, being turned into pet food.

Unluckily for modern hens, producing eggs no longer requires the presence of a rooster, which would at least add a little excitement to their lives. The average hen today is not even likely to know that male birds exist, and has no chance of producing a fertilized embryo. Contrary to common belief, the little blood spots you occasionally see inside eggs are not the sign of a fertilized egg. These are caused a by ruptured blood vessel during formation of the egg. (These eggs are perfectly good to eat even if you don't remove the blood spot.)

TASTINGS The egg factory

It only takes 24 to 26 hours for the hen to develop a complete egg, ready to lay. As soon as she lays one, her system is ready within half an hour to begin to

produce the next. Occasionally two ova drop at the same time, these develop into double-yolked eggs.

The U.S. is the largest egg producer in the world with good quality, healthy eggs handled in a highly automated process. The chicken house has been turned into a true egg factory. The eggs roll directly from the chicken to a soft conveyor belt on a gently-sloping floor, and in minutes a belt moves them to the washing, sorting and packing area, chilling room and finally for transportation in refrigerated trucks to the wholesaler within a few days. All these are fully automated. Large farms work with over 2,000,000 birds, nearly the human population of Arkansas. Machines at these farm factories can grade and pack 54,000 eggs an hour. For this enormous egg production we need a large flock of hens. In the U.S. the population of egg-laying hens alone in 1998 was 256 million, close to the country's entire human population.

Eggs from free-ranging hens that were fresh-tasting with deep-yellow yolks and firm whites are gone forever, except for the very few who live in the country with a hen-loving neighbor. Those eggs certainly beat today's supermarket eggs. Yet, on today's large egg farms, the hens receive an optimum scientific diet to produce wholesome, high-quality eggs, always sold fresh at very reasonable prices.

TASTINGS Chicken feed and eggs
To produce one dozen large eggs (about 1½ pounds or 680 g), a hen needs to eat 4 pounds (1800 g) of chicken feed. Hens were less efficient layers in the past. In 1960, a hen had to eat over 6 pounds (2700 g) of feed to lay a dozen eggs.

What's in your egg

The seemingly simple egg is extremely complex. The white is two-thirds albumen, an opalescent-white protein. Egg whites can increase 6 to 8 times in volume when you beat air into them—a blessing in many baking projects. The yolk is a mixture of protein, fat and cholesterol with a powerful emulsifying effect.

Inside the egg white are two twisted cord-like substances, the *chalazae* (pronounced kah-LAY-zah) that often get wound around the beater while you are whipping egg whites. The two ends attach to the opposite ends of the yolk and also to the white, with a purpose to keep the yolk centered. These cords are firm, prominent and rather strong in fresh eggs, but they weaken with aging, letting the yolk drift off-center. When you want attractive hard-boiled eggs with well-centered yolks, older eggs with weakened chalazae are less likely to give the best result.

There are two membranes between the egg white and shell, a good defense against any microbes. One membrane is glued to the shell and one to the white with a thin layer of air between them, something like a double-pane window. These membranes can be a real pain for cooks when they aim to have neatly-peeled hard-boiled eggs.

The egg shell itself is something the cook could do without. It is embarrassing when one of your dinner guests crunches on a small bit of shell in your masterpiece Raspberry Charlotte. Egg shell gives a truly amazing protection to the otherwise highly perishable stuff inside, particularly the high-fat yolk, which would turn rancid quickly. It is not like aluminum foil—it doesn't seal the egg in completely. The shell is porous so oxygen from the air and carbon dioxide from inside can exchange places, designed with the embryo in mind allowing it to breath. The pores are small enough so microbes cannot enter the egg. If the egg is not fertilized, there is no

chick to breathe, but the porous egg shell still lets gases in and out very slowly, gradually deteriorating the quality of the egg itself. At cooler temperatures deterioration is even slower.

It is the egg shell that allows the egg to remain viable in a non-refrigerated nest for a week or two before the hen is satisfied there are enough to make incubating them worth her while. The shells themselves have a protective coating to keep harmful microbes out, too. The washing process in the egg factories also removes that protective coating, but processors replace it with a thin film of oil to retard the exchange of gases and loss of moisture, thus extend shelflife.

Egg Nutrition

Eggs are one of the few nearly complete foods for a human body—nature designed them to be the sole source of food and nutrients to the fast-growing chick embryo. Their protein content is high, 13 percent (or 6 grams in each large egg). Even the egg shell is nutritious, 96 percent calcium carbonate, an essential element for building human bones (but how do we eat it?). If the kids get upset with bits of egg shell in their scrambled eggs, assure them that you are just trying to help them build strong bones.

Once a favorite breakfast food in the Anglo-Saxon world, egg consumption has steadily declined since the 1950s. Americans ate 402 eggs apiece annually in 1945 (1.1/day). By 1991 per capita consumption had dropped to 234 (0.6/day), but it is slowly rising again. In 1998 the annual consumption is 255 eggs. The major reason for the decline is all that cholesterol in the yolk, a health concern to many people today. A large egg contains an average of 215 milligrams of cholesterol. Its total fat content is a moderate 5 grams or 10 percent of each egg. All the cholesterol and fat are in the yolk.

TASTINGS. **What's Inside the Shell**

	Water	Protein	Fat	Minerals + Vitamins
Whole	65.5%	11.8%	11.6%	11.7%
White	88.0%	11.0%	0.2%	0.8%
Yolk	48.0%	17.5%	32.5%	2.0%

Food scientists are working feverishly to reduce the cholesterol level of eggs, attacking the problem on several levels. One approach is to cut down on the development of cholesterol before the hen produces the egg. Biologists are putting laying hens on special diets to do that.

Another approach is to chemically remove some of the cholesterol after the hen lays the egg. If we can take the caffeine out of coffee beans, surely we can reduce the amount of cholesterol in eggs to a tolerable level. It is just a matter of time. But to do this, biochemists have to remove the eggs from the shells and add chemicals that bind with the cholesterol, then remove the chemical together with the cholesterol. This part was easy. They ran into problem getting the eggs back into their original containers after they reduced the cholesterol. At this time they can only market the low-cholesterol eggs as scrambled or separated into yolks and whites.

Genetic alteration of the hens is another approach they are working on. In early 1995, a small egg farm in the Milwaukee area introduced "designer" eggs with 25 percent less fat and 25 percent lower cholesterol using this technique.

Buying Eggs

Buying eggs is even easier than buying milk. You find the right size, the right color and cross eggs off your shopping list. All eggs you find in retail are grade AA, the top grade, the only question you may have is about their freshness. Today's eggs are much fresher than they used to be because of stricter industry regulations on storage, that require refrigeration all the way from the farms to the store shelf. Until the late 1980s most markets had their eggs displayed along with bread and other non-perishable items on non-refrigerated shelves.

Although you cannot tell for sure which carton has the freshest eggs, most cartons do have a hidden number somewhere on the side that shows the packing date. The system uses the Julian date. The number indicates the numerically consecutive day of the year they packed the carton, with January 1 being "1", and continuing to December 31, which is "365." For example, eggs they packed on February 2nd have 33 as packing date. Pick a carton with a number closest to the day you are shopping. The industry is now slowly replacing packing date with an expiration date on the carton. The day they stamp is 30 days after packing.

Your kitchen is where you can really tell how fresh an egg is. A common way to measure the freshness of an egg is the water test. A fresh egg is heavier than water, it sinks and flips readily onto its side when you immerse it. If it sinks but sits on one end, air has begun to accumulate in the air pocket in the top end, which means it is been around for a while. It is still good to eat but if enough air has collected inside for the egg to float, it is past its prime. These older eggs are better in baking than served at a meal.

Here is another test. Break the egg onto a flat plate—the way the white behaves gives its age away. The runnier and more watery the white, the older the egg. The yolk also changes over time but not quite so obviously. It flattens, and the color becomes mottled. If the egg white runs out on the plate as a thin pancake syrup with a flat yolk in the middle, discard the whole thing (even better, feed it to any of your pets).

Large eggs are the standard American and Canadian baking size. Nearly all recipes call for large eggs, but one egg size smaller or larger doesn't make the slightest difference in any recipe, except you may need to adjust the liquid ingredient slightly. Variables in other ingredients and cooking techniques have much more effect on the final product than the size of the eggs. Only when you are using three or more eggs in a recipe does the difference start to add up. Here's a convenient conversion table for different sizes.

Egg Size Equivalents

Jumbo	X-Large	Large	Medium	Small
1	1	1	1	1
2	2	2	2	3
2	3	3	3	4
3	4	4	5	5
4	4	5	6	7
5	5	6	7	8

You may want to buy different sized eggs than the customary large, if lower price or other reasons justify it. Use the table above to help you recalculate your recipe. To compare prices of various sizes, the most direct way is compare their prices per unit weight (pound or kg). The following table lets you do that easily.

Weight of Eggs for Varying Sizes

Egg Size	Oz/dozen
Jumbo	30
Extra large	27
Large	24
Medium	21
Small	18
Peewee	15

The color of an egg shell has no relevance of what's inside that shell in any culinary use. Brown, white and yellow (even bluish-green for one chicken breed) all have the same nutritional value, the same flavor and same behavior in heat, in whipping, in its thickening property. Only the pigmentation of the shell is different. So much for the old belief that brown eggs are more nutritional. Interestingly enough, different colors are more popular in different geographic areas. The Northeastern U.S., for instance, has a definite preference for brown, while West Coast states prefer white-shelled eggs.

If your cholesterol level is a concern, you have one more choice at the store, the yolkless egg. Products in the supermarket refrigerator or freezer labeled "no-fat, no-cholesterol eggs" or just plain "egg substitutes" are simply egg whites with some chemical additives that take the place of the yolk, usually thickeners, stabilizers, emulsifiers, vegetable oil, and of course, coloring. These yolkless eggs cost 2 to 4 times more than whole eggs. Consider buying whole eggs, using the whites only and passing the yolks on to your neighbor. Your pet rabbit will gladly accept them, too, mixed in with its regular food. You will avoid the chemical additives that come with the substitutes, too.

Eggs in your Kitchen

Safe eggs

Eggs in unbroken shells are wholesome and perfectly safe. In the past no one hesitated using them raw in hollandaise sauce, Caesar dressing or holiday eggnog. Second thoughts began with an outbreak of food poisoning in the Northeastern U.S. in the late 1980s. Epidemiologists traced the food poisoning to *Salmonella* bacteria that managed to infect hens' ovaries. These bacteria passed into the egg before the shell was formed, a completely unexpected route of contamination. How did such an infection happen all of a sudden when we had no such contamination for centuries (or at least, we weren't aware it)? Scientists think that they can trace the cause to a new feeding practice of poultry farmers. To reduce waste, poultry farmers ground up any dead chickens that happened to be on the farm and mixed it in with their regular chicken feed. This sounded like a good idea—it reduced waste as well as added high protein to the chicken feed. But, if scientists are correct, the practice backfired. The resulting chance of *Salmonella* infection of eggs created uncertainty of safety in many raw-egg recipes in both home and commercial kitchens.

Overnight, chefs and home cooks modified their recipes for any dish using raw or only slightly cooked eggs. Hygiene in the chicken coop and egg processing industry came under strong scrutiny and has improved tremendously since then. Fortunately, even moderate heat kills

Salmonella or any other bacteria that might infect eggs, and pasteurizing eggs also solves the problem. All liquid egg products (shelled and sold in bulk either whole or separately as egg white and yolk) must be pasteurized in the U.S. They heat liquid eggs to 140°F (60°C) for 3½ minutes, a temperature not high enough to coagulate either the white or the yolk, but high enough to destroy the bacteria.

Studies since the food poisoning episodes of the 1980s show that the infection rate from eggs is extremely low, perhaps one in 10,000. Even if you eat an infected egg, you are getting a relatively small number of bacteria if the egg has been handled properly all along the distribution route. *Salmonella* doesn't multiply in cold temperatures, and it takes millions of bacteria to make a healthy person sick.

Unlike in a commercial kitchen setting, where contamination can become a problem, you can control the risk at home by handling eggs appropriately. I still don't recommend you use raw eggs. But hard-boiled eggs and runny omelets are perfectly safe. Cooking eggs at 145°F (63°C) for 15 seconds kills all harmful bacteria. Since egg white coagulates between 144° and 149°F (63° and 66°C), you have reached the safe temperature by the time the whites are no longer liquid. Yolks coagulate at a higher temperature, so the egg is perfectly safe to eat even if the yolk is a little runny. When cooking an omelet or scrambled eggs, keep in mind that the combined white and yolk coagulate at about 156°F (69°C). Once the mixture becomes solid (and dry), you've gone well beyond the safety factor. You can take a perfectly safe omelet off the heat when it is just barely set.

When in an unbroken eggshell, the egg is only slightly perishable. Once you crack the eggshell, what's inside becomes as perishable as dairy products and meats. Separated egg whites, however, remain safe even raw. Bacteria doesn't grow in the white, partly because it is not a nourishing environment to bacterial growth, but also because it contains an enzyme *(lysozyme*), which inhibits bacterial growth. Don't worry about the little floating islands of beaten sweet raw white foam on top of eggnog in a punch bowl or folded into mousse and fruit fools. Egg yolk, on the other hand, is very hospitable to bacteria, even more so at warm temperatures.

Egg cookery

Cooking an egg properly is not as easy as boiling water. You can ruin eggs, or dishes containing eggs, in seconds, and there's no bringing them back to edible. The major problem in cooking eggs is that they are as sensitive to heat as rubber—and heat them too fast or just a little too long, and they'll *will* be like eating rubber. But first let's explore their uses.

Besides being a good source of nutrition, eggs also perform three culinary tasks with profound significance in western cookery:

1. Binding—for example, in custards the yolks and whites act together to thicken and bind other ingredients in the liquid. You activate this by low heat until both coagulate, solidify and incorporate the rest of the ingredients into their structure.
2. Emulsifying—for example, in mayonnaise, salad dressings and hollandaise sauce. It is the egg yolk that permanently suspends oil in water. Yolk is an emulsion, which makes it an efficient emulsifier with other ingredients. Emulsions are complex systems that form according to physical and chemical laws.
3. Foaming—as in sponge cakes and soufflés. The albumen in the egg white is able to hold enormous quantities of air in its structure when you beat it, and it forms a semi-stable foam. Here beaten egg whites act alone in two similar capacities—as leavener to

give a light, airy texture and as a semisolid network of support to give structure to the baked product.

Eggs are useful in two other ways: they lend their delicate yellow coloring to whatever you bake with a yellow pigment *(xanthophyll)* in the yolk and, secondly, they also act as a glue for breaded foods. When the egg coagulates in the heat (oven or deep-fry oil), a tight adhesion forms between the food and the breading material.

Coagulation and cooking

Coagulation of the egg is a vitally important process in cookery, important enough that understanding how it works helps you with your cooking.

When an egg coagulates, the proteins go through a distinct physical process. The raw egg proteins are long, thin molecules that fold into themselves something like a crumpled-up candy wrapper. They look like globs under a microscope. Heat adds energy to these globs, and they begin to unfold. Add more heat, they unfold more and they form a network of long chains, like spaghetti strands floating in boiling water. If you remove the egg from the heat at this stage, you have a soft, moist, scrambled-egg-like substance. If you continue exposing it to heat, the coagulating protein strands entangle and form tight clumps with each other and begin to contract. The clumps become so stiff and rigid that they cannot hold much moisture. Whatever moisture the protein strands held they release as steam from your pan, the egg becomes dry and withered. But you can trick the egg proteins into retaining their moisture while exposing them to very high heat (see the recipe) through stir-frying.

I discovered stir-fried eggs accidentally when I was visiting a friend in Toronto. In the early morning when everyone else was still asleep, my friend's 10-year old daughter, Jenny, offered to cook a couple of scrambled eggs for me. I love good scrambled eggs, but it takes some know-how to keep them moist, soft and tender. I was wary but she looked so eager that I could not refuse the offer diplomatically. She lightly scrambled two eggs in a bowl while, to my horror, she turned the heat on full blast under a small, heavy skillet. Everyone knows that high heat kills any chance for moist, soft scrambled eggs.

She let the pan heat for a minute or two until it was very hot—a condition that is true murder on the eggs' protein molecules. She splashed a tiny bit of oil into the pan, then added the eggs all at once while gently stirring. In less than half a minute she spooned the eggs onto my plate. I could not believe it. They were the best-tasting, most moist and tender scrambled eggs I'd ever had. I've used Jenny's method ever since.

What Jenny did was to fool the egg proteins. Ordinarily, high heat unfolds the long protein molecules. With continued heat they clump together, contract and expel most of the moisture. But with very high heat all they did was unfold. The cooking process was so fast that the molecules did not have a chance to clump up, and they retained all their moisture.

Stir-fried eggs

Stir-fried eggs are the Oriental scrambled eggs.

Oriental cooks use the same method to stir-fry eggs before adding them to other stir-fried ingredients, as in egg foo yung.

Ingredients

4 eggs
¼ teaspoon salt
¼ teaspoon freshly ground black pepper
1 scallion including some of the greens, finely chopped or 1 tablespoon fresh chives, finely chopped
¾ teaspoon fresh tarragon, finely chopped or ¼ teaspoon dried tarragon, crumbled
1 teaspoon vegetable oil
1 teaspoon butter

Procedure

1. Scramble the eggs lightly in a bowl with salt, pepper, scallion or chives and tarragon.

2. Heat a heavy medium skillet on high heat for 2 to 3 minutes until very hot. You may use a wok instead. Have a wooden spoon and two warm plates ready.

3. Add oil and butter to the skillet, spread around by tilting the pan and when the butter sizzles quickly add the eggs. Stir gently but constantly with the wooden spoon so all the liquid egg is in contact with the hot metal surface. The eggs should set in 15 to 30 seconds. Quickly scoop them onto two plates before they dry out. Sprinkle the eggs with a dusting of paprika and garnish with long slivers of scallion greens or chives.

Makes two portions.

Both the white and yolk of egg coagulates when exposed to heat. Very few foods go through such a drastic change so suddenly under heat. To watch this process, add well-mixed eggs slowly into simmering chicken stock, stirring constantly. The egg solidifies immediately and transforms that ordinary stock into egg-drop soup! Or beat up an egg and pour it into a very hot oiled pan. In less than a minute you have coagulated it into scrambled eggs.

I already discussed above that egg whites coagulate at a slightly lower temperature than yolks. Frying an egg sunny side up illustrates this". The white coagulates between 144° and 149°F (63° and 66°C). At the lower end of this range the white turns jelly-like, and raising it just a few degrees more, it firms up. The yolk starts to coagulate close to the point where the white is already firm, 149°F (66°C). It has to reach 158°F (71°C) to become solid. Adding ingredients, such as sugar or milk, increases the coagulation temperature for both whole scrambled eggs and for scrambled yolk. Custard, for instance, which contains lot of milk and sugar, doesn't coagulate until 190°F (88°C). Any sweetening or diluting with another liquid does the same. Adding acid or salt to eggs, on the other hand, lowers the coagulation temperature. These are important facts to remember.

Two areas of cooking with eggs take some caution. One is cooking eggs on direct heat, such as frying. Slow cooking over low heat is the key here. Start off with a medium-hot pan to avoid sticking, even if your pan is non-sticking. The eggs should be at room temperature so adding them doesn't chill the fat in the pan. Reduce the heat to low and cover the pan. The accumulating trapped steam helps to speed cooking the egg white. Once cooked through, continue cooking without cover until the egg yolks coagulated to your liking. Or flip it over for just a few seconds to finish cooking both whites and yolks and remove at once.

The second precautions is when you use eggs to thicken and bind a liquid (puddings, custards) in which case you dilute the eggs in plenty of liquid. This is the more difficult task. The

trick to end up with smooth egg dishes is to control the coagulation by heating the concoction very slowly. That is why cooks bake egg-rich dishes in a water bath. The water keeps the mixture from heating too fast and also keeps it to below the boiling temperature of water. When cooking such a mixture on top of the stove (custard for instance), you keep the temperature low and stir continuously. You apply heat slowly, gradually and uniformly. Continuous stirring assures that the long protein molecules have no chance to clump together (and form scrambled eggs). The result is a very smooth, creamy dish. The price you pay for this is sweating over the hot stove until the mixture thickens. The eggs take their time, and you cannot speed them up. Checking the temperature with a thermometer gives you an idea of how far along you are in the process.

Note again, that in both areas of egg cookery the key is slow, gradual heating for best result.

If you are an impatient cook (like I am), there is a trick to speed up the process with a technique called tempering the eggs. Here is how to do it. Thoroughly beat the whole eggs (or yolks) in a bowl. Heat up the liquid (often milk) to near boiling. Add the near-boiling liquid to the eggs, a spoonful at a time to begin with, while stirring constantly and zealously. Keep adding more hot liquid, now a little more each time, until you mixed about a third of it into the eggs. At this point, you tempered the eggs, and you can dump the mixture into the rest of the hot liquid without danger of coagulating them into clumps. Keep heating and stirring the mixture over low to moderate heat. In a few minutes the liquid thickens into a velvety smooth sauce or custard.

You cannot reverse the coagulation (curdling), unless you catch it at an early stage. If that happens, remove the pan from the heat immediately and beat the mixture vigorously to break up the clumps. If you are successful, continue heating *slowly*. If you are not, the process has already reached the point of no return, and the egg mixture will help to add shine to Fido's fur coat after Fido gobbled it up.

TASTINGS Ostrich eggs
The average ostrich egg weighs 5 pounds (2¼ kg). It serves 20 people with portions equivalent to two large chicken eggs.

Cooking whole egg in the shell

If you can boil water, you should be able to boil an egg, right? But cooking them and ending up with easily peelable shells and perfect, bright yellow, still-moist yolks in the dead center of the whites is somewhat trickier.

First, let's straighten out our terminology. The American Egg Board declares that there is no such thing as a hard-boiled egg. Eggs simply should not be boiled, the egg people maintain. It is a *hard-cooked* egg that we are after, and we accomplish this by cooking them in barely simmering water or letting the eggs stand in water that is just been brought to boil. Although the American Egg Board may be correct, the terms hard-boiled and soft-boiled are too firmly entrenched in our kitchen terminology to change.

An overcooked egg has a dry and discolored yolk. Too much heat eventually breaks down proteins, and discoloration occurs as these react with sulfur and iron compounds in the yolk. To avoid this fate, set your timer and cook an egg no more than 10 minutes. A centered yolk is critical only when you are planning to cut the cooked eggs in half. The Egg Board says storing eggs pointed end down gives a better chance of a centered yolk. Egg packers always pack

them this way in the cartons. Other sources say to store eggs with the pointed end up. Some experts firmly believe you should store them on their sides. Since that covers all the options, it is hard to come up with a fourth alternative. Some cooks recommend gently stirring the eggs during cooking to jiggle any off-centered yolks back into their proper position. I have no recommendation—I still haven't found a way to guarantee a perfectly-centered yolk.

Peeling hard-boiled eggs

To peel the shell off both easily and fast, leaving a fully intact egg behind is visually important for some recipes, especially hors d'oeuvres. Nothing is more frustrating than trying to remove a shell that won't let go of the egg white. You end up with an egg that looks like an outer-space-pitted meteorite.

Let's look at the physics of what makes one egg peel readily and another cling to the shell as if its life depended on it. I discussed above the two membranes that is between the shell and the white. First, the fresher the egg, the stronger the bond of the outside of those two membranes. With aging, the membranes shrink and the bond weakens. Because of that strong bond, hard-boiled fresh-laid eggs are the toughest to peel. Once they are about a week old, the membrane's bond begins to weaken considerably. That is one thing you don't need to worry about when you buy eggs at the supermarket. No eggs are likely to be less than a week old by the time they hit the supermarket shelf.

Not only their freshness, but the way you cook eggs can also affect the shrinking of the membrane. First, bring eggs to room temperature before cooking them. Starting with cold eggs ups the chances of cracking while in the cooking water because there is too much temperature change. Eggs should warm up in an hour or two on your counter (depending how warm your kitchen is), or in a pot of very warm water in a few minutes.

Place the eggs in a cooking pot. Fill the pot with water to about an inch above the top of the eggs. (Adding salt to the water, as some cookbooks recommend, does nothing to aid in peeling, and it doesn't help the flavor, either. The salt does not penetrate the shell.) Turn the burner on high and keep an eye on the pot. As soon as the water starts to boil, put the lid on and reduce the heat. Simmer in barely bubbling water for 10 minutes.

Remove the eggs from the hot water with a slotted spoon (don't pour the hot water off yet), set them in a bowl and run cold water over them for half a minute to give them the shock of their lives (this helps prevent yolk discoloration, too), then put them back in the hot water for another half a minute for another shock. Drain the hot water and place the pot under running cold water until the eggs feel cool, 3 to 4 minutes. The shocks should shrink the fine membranes enough to separate them from the shells and the eggshell should come off easily, but don't be in a hurry. If you have the time, the shell comes off even easier if you let the eggs chill for a few hours.

The first step in peeling is to place all the eggs in an empty pot, cover with a lid and shake them gently up and down and side to side, so they bang against the pot and each other. This shatters the shells into a network of cracks, another help to peel. Be gentle so the eggs themselves don't break. The shells are now as easy to remove as freshly blanched tomato skins. Soaking the eggs in water for half hour after cracking them is also helpful if you have the time. The water seeps in under the shells, and they almost fall off by themselves. Peeling under running water or in a large bowl of water is another good idea. Start peeling at the flat end as that is the end that contains the air pocket. Peel the shells off so the membranes remain with the shell,

not on the egg white. Food industry egg peelers who peel eggs by the thousands, day in and day out, use this technique, piling the perfect oval, shiny, nude eggs in small mountains. No machine has yet been invented for this job that can match the human touch.

TASTINGS How to tell if the eggs are cooked or raw
Have you ever had to decide whether an unshelled egg is cooked or raw? Sometimes it happens when you forget to label cooked eggs before putting them in the refrigerator. Next time, instead of cracking it open to find out, set it in the middle of the table and give it a good spin, then stop it abruptly and take your hand away. If the inside is still liquid, the egg will continue to move a little from the still-spinning liquid inside. A cooked egg stops dead.

If you are planning to chop the cooked eggs, neither centered yolks, nor easy peeling matters. With a forceful pressure of a French knife cut each unshelled egg in half. Scoop out the egg from each half shell, check for stray pieces of shell, then chop the eggs.

Soft-boiled eggs

Soft-boiled eggs are simple because you don't need to worry about easy peeling. Bring them to room temperature before cooking to avoid them shocking in boiling water and the shell cracking. If you are in a hurry, place refrigerated eggs in a bowl of very warm water. In 10 minutes they will be near room temperature. When the water is boiling, slip the eggs in the pot one at a time with a spoon and start the timer. Cover the pot and keep the water on a gentle simmer. For large eggs, 4 minutes of cooking gives you firm whites with runny yolks in the middle. Adjust this time half minute either way for softer or firmer eggs. Similarly, adjust the time if you use smaller or larger eggs than the standard large size.

Separating eggs

The electric mixer and a good technique make it possible to produce perfect egg white foam each time. However, with a good technique and some muscle you can produce just as good egg white foam beating by hand and nearly as fast.(See the Dessert chapter for specifics.)

But before you can whip up egg foam, you need to separate the whites from the yolks. If you are inexpert with egg separating, sacrifice a dozen to perfect your technique—it is worth it. Numerous recipes call for separated eggs and you will be glad to be able to do it without fear.

When you crack the egg shell, try to make the break at the halfway mark. Either crack it against the sharp edge of a bowl or cup, or hit it with the dull edge of a small knife while holding the egg in your hand over a bowl. Not too hard, so the egg yolk will not break. As the egg comes apart, keep the yolk in one half of the shell while letting the white run into the bowl. Gently slip the yolk from one half-shell to the other letting more of the white dribble into the bowl. Repeat this until very little white is left with the yolk. Now pour the yolk into a second bowl.

Some cooks break eggs into their hands and let the whites ooze through their fingers—effective and sensuous.

Don't accumulate more than 2 or 3 egg whites in a bowl just in case a yolk breaks and some slips in with the whites. Many cooks use three bowls. This third bowl is just for separating—once you see that the egg white is free of stray yolk pieces, add it to the main egg

white bowl. Even the tiniest amount of yolk keeps the egg whites from beating into a foam with best volume. The fat in the yolk interferes with the foaming process. If you see any yolk that slipped thrugh, fish it out with half an egg shell or a small spoon. Do the same with any stray egg shells.

TASTINGS Converting eggs to common kitchen measures
5 whole large eggs = 1 cup
7 large egg whites = 1 cup
12 large egg yolks = 1 cup
1 egg white = approximately 2¼ tablespoons

Storing eggs

For maximum shelflife and flavor, refrigeration is always best for eggs. Don't worry about leaving uncracked eggs on the kitchen counter for several hours—the shell is a good protection against microorganism or spoilage. (Hens leave them like that for a week or two without harm.) But once the shell is broken or cracked, store it like you do your milk. Egg distributors store fresh eggs for 6 to 8 weeks at 46° to 50°F (8° to 10°C) at high humidity. Storing them at colder temperature is hard on the quality, too. Most home refrigerators run at around 40°F (4°C), a little too cold for eggs. Store your unshelled eggs in their carton in the warmest part of the refrigerator, either on the top shelf or in the door.

Packaging experts designed egg cartons to keep moisture in, odors out and rigid enough to reduce the danger of cracking or breaking the fragile shells. Don't transfer them to the egg storage cups built into some refrigerator doors. (Refrigerator designers didn't consult food scientists on that one.)

TASTINGS 1000-year-old eggs
We have all heard about thousand-year-old Chinese eggs but they grossly exaggerate their age. The Chinese preserve them in lime (the chemical, not the citrus), pine ash and salt, but not even for 1,000 days. They keep fresh raw duck eggs in the mix for 50 to 100 days. The shell comes out looking rough and earthy (like a 1000-year old artifact), and the inside turns translucent blue-green and firm.

Freezing raw scrambled whole eggs in small packets is a convenient way to handle an egg deficit emergency. Whole eggs out of the shell freeze well. Egg whites also freeze well by themselves and are good for any purpose after defrosting, including whipping into perfect foam. Keep the extra egg whites in a jar in the freezer. Some people prefer to freeze egg whites in ice-cube trays. Once frozen, they pop out the cubes and store them in a plastic bag in the freezer, with a label giving the amount of egg whites in each cube. That way they can defrost a little at a time instead of the entire collection.

Freezing egg yolks alone, however, calls for some extra effort. They turn into a thick gel (the process is called *gelation*), that becomes a rubbery mass when you defrost it. But there is a solution. Gently stir either salt or sugar into the yolks that stabilizes them at the rate of. 1/8th teaspoon salt or 2 teaspoons sugar for every 4 yolks. Freeze egg yolks in the smallest possible

containers and lay a piece of plastic wrap directly on top of the yolk, then cover the containers. This eliminates as much air as possible.

When you defrost the yolks, they may still be slightly rubbery, but the gelation process is reversible. Very gently heat the defrosted yolks to about 113°F (45°C) (very warm bath water temperature) while stirring, and they become soft and smooth as sour cream, just like a gelatin-based dish turns soft on warming. The easiest way to accomplish this heating is in a double-boiler-like hot-water bath. Vigorously stirring a few drops of water into the yolks after defrosting also softens them, but with this method they still tend to remain somewhat lumpy and grainy.

TASTINGS Tips for extra whites and yolks

Too many egg whites? Here are a few ideas on how to use them up:

- fruit whips, white cake, angel food cake, chocolate crumb cake, meringue topping, meringue cookies, substituting two egg whites for one yolk in cookies, bars and squares

Too many egg yolks? You can use them in:

- custards, puddings, zabaglione, parfait, béchamel and mornay sauces, mayonnaise, salad dressing, thickeners for soups and sauces.

If you have extra yolks that you can use within a few days, store them in the refrigerator. If the yolks are whole, pour a little water to cover them in a small container before refrigerating. When ready to use them, gently pour the water off.. If the yolks are broken, mix in a little water and lay a piece of plastic wrap directly on the surface before storing in the refrigerator to help prevent oxidation.

Dehydrating them is one good method to preserve eggs for long-term, and they are useful to have on your shelf for emergency standby. Food processing companies use dehydrated eggs regularly—they are convenient and can stay on the shelf unrefrigerated for years. They also commonly stockpile dehydrated eggs to offset seasonal price increases. Some fast-food restaurants also use dehydrated eggs, although it is hard to make a decent fried or poached egg from the powder. But they are perfectly good for any baking where the recipe calls for whole eggs. Natural foods stores and co-ops selling bulk foods often carry them. Keep a small jarful with your staples.

Points to Remember

- Milk and cream curdle in acidic condition as a group of proteins precipitate. Fruit, fruit juices, even some vegetables are acidic enough to trigger curdling. Adding a starch to the acid ingredients prevents this chemical reaction.
- Cook cheese the shortest time possible—just until it is melted if it is part of a dish or melted and browned if on top of a dish.
- The higher the moisture content of a cheese, the more perishable it is. Dry, low-moisture grating cheeses don't even need refrigeration, except for long-term storage.
- Use heavy (whipping) cream for whipping, preferably not ultra-pasteurized. Cream, bowl and beater must be very cold. Use no more than 2 tablespoons sugar per cup of cream.
- Eggs in the shell are not very perishable, but their quality deteriorates faster if not refrigerated. Egg whites out of the shell are not perishable, but treat egg yolks like dairy products.

- Eggs you fry until the whites are firm but yolks still runny are safe from bacterial contamination.
- When using eggs as thickeners and binders (custard, puddings, sauces), continuous stirring over slow heat prevents curdling. Tempering eggs first can speed up the process. When cooking eggs over direct heat, do it either very slowly or very fast to prevent dry, withered eggs.

If you have never made bread,
behold one of the great dramas of the kitchen
I.S. Rombauer, M.B.Becker in Joy of Cooking

BREAD—OUR MOST INDISPENSABLE FOOD

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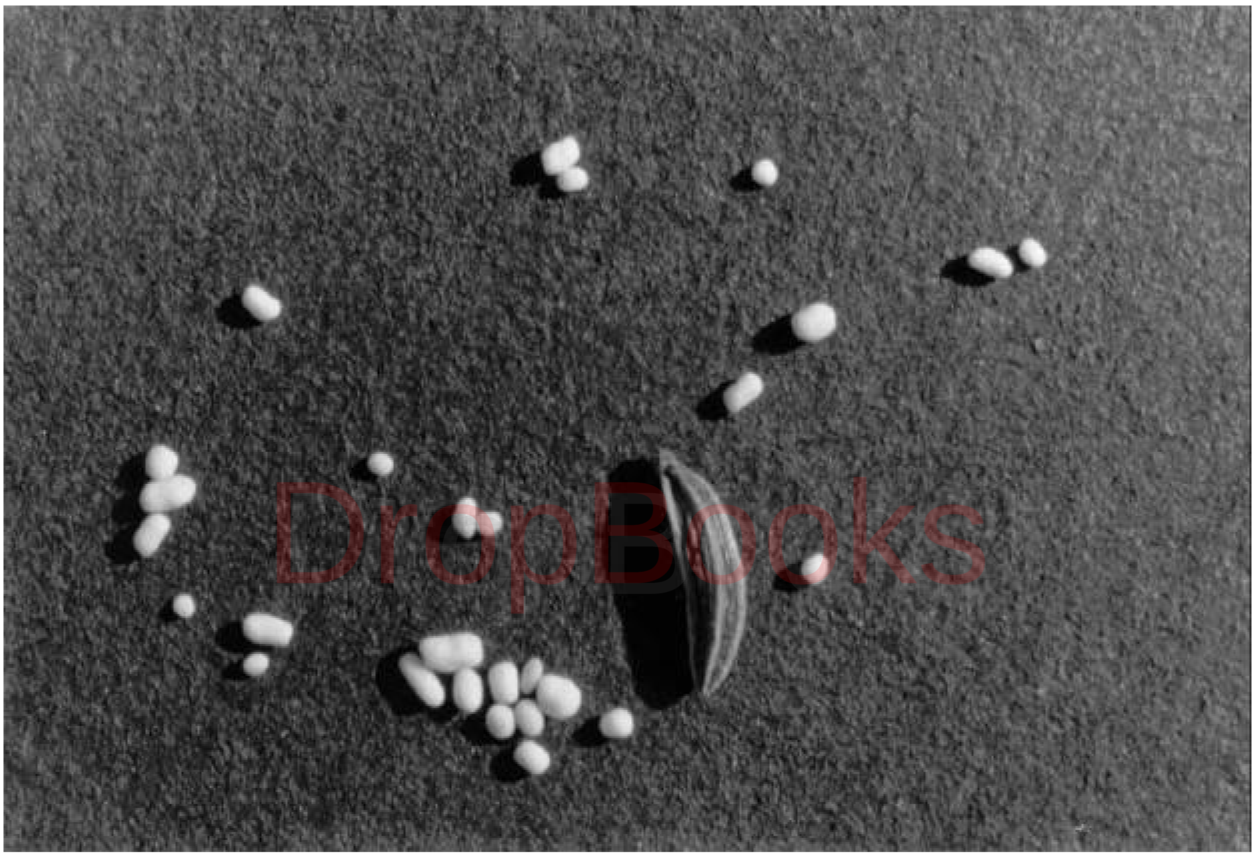

Dry yeast and caraway seeds
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Are you on vegetarian, macrobiotic, vegan, semi-vegetarian, white-meat-only, meat-and-potato or any of the scores of other popular or fad diets? Whatever your choice, chances are you serve bread at least once daily—bread is one of our prime, indispensable, vital staple foods. Even prisoners in dungeons, if given no other food, are allowed bread and water. Bread and water can sustain life for quite a while.

Virtually every food on today's American and Canadian menu has changed over time, some only slightly and others drastically. Everything has been "improved," especially since the 1970s. One food, however, hasn't changed a bit—bread is still the staff of life. Bakeries 50, 100 and 200 years ago baked virtually the same breads and other bread products that they do today. In fact, the dozens of different breads in the bakeries of the Roman Empire 2000 years ago could be on the shelves of today's bakeries—they would be virtually identical breads, similar in shapes and flavor. The only noticeable difference in the two bakeries would be the shiny glass display cases and the computerized cash register. And, to a large extent, the attitude of the bakery assistants.

History

Leavened bread goes far back into human history. Bread's main ingredients, flour, water, salt and yeast were easy to obtain. As soon as humans discovered how to grind the seeds of the common wheat grass into flour and combine that flour with water to make a dough, the next step, leavening the dough, was only a short step. Someone left the moist dough in a clay pot for a few days and yeast from the air mysteriously leavened it. People accepted the peculiar rise of dough but could not explain it for several millennia until the 1800s.

References to bread appeared several thousand years before the Jews and Christians started baking their own. A 5000-year old piece of bread archeologists found in an Egyptian tomb sits in the New York Metropolitan Museum of Art. Although it is quite stale by now, it is still clearly recognizable as bread.

But bread has always been more than just food. "Breaking bread" with someone is not only sharing a meal, it is also a form of diplomacy. Traditionally, people did not cut bread but broke it to maintain its sacredness. Cutting with a steel blade was considered a barbaric, cruel act, unsuitable for dividing such highly-esteemed food as bread. Breaking of the bread by hand is still a ceremonial tradition for many, including the Jewish Friday-night welcoming of the Sabbath.

To show their respect, German bakers in the old days never turned their backs toward their ovens. Spanish bakers and religious Jews even now kiss a piece of bread that falls on the ground to show their reverence and high esteem. And remember that the highest respect in Christian-Judaic place, Bethlehem means *House of Bread*. Bread has always been a symbol for life and to this day it is prominent in our daily meals, even though it lost its sacred status. That is not surprising. It is hard to give a blessed status to the soft, sliced, preservative and chemical-filled cheap spongy stuff in a plastic bag that fills most of the supermarket bread shelves.

Nutritious and good tasting, you can eat this inexpensive staple with any other type of food at any time of the day, or it can make a meal by itself. During harsh times brought on by poor economic conditions, drought or crop failure, bread made from cultivated crops was the first staple that truly relieved hunger and starvation. No wonder it was a sacred symbol.

Some form of bread adorns every holiday, festive and ceremonial table in all Western and many Eastern cuisines. The European tradition calls for rich sweetened yeast breads, particularly

Easter and Christmas breads, while other countries use baking powder to leaven their equally rich sweet breads. The notable exceptions are Chinese, Japanese and a few other Oriental cultures, in which bread is virtually absent.

The Many Shapes of Bread

Both the shape and taste of bread developed distinctly in different parts of the world based on the local ingredients, available technology and climate, and those became their bread traditions. Yeast-leavened wheat flour breads are truly European in origin (including the Russian portion of Asia). In most of Asia, as well as throughout Africa, wheat bread is less common, and even where used, it is often unleavened such as the Indian *chapatis*.

Millers made flours from other grains than wheat, and from root vegetables, but these were only locally prevalent. American Indians used maize or corn, since that was the grain they grew and it was available. Other ethnic groups used flour ground from whatever grew naturally in their particular areas—rice, potato or millet, for example. Now so inexpensive, that wheat flour is readily available and people accepted yeast-leavened wheat bread everywhere in the world, even where it has been an unknown food 50 or 100 years ago.

Here is a list of many of the well-known and many obscure ethnic breads of the world.

Country	Name	Description	Comments
Italy	*Focaccia*	Sage or rosemary bread rich in olive oil	This is a close cousin of pizza dough
	Tuscan bread	Large round shape	
	Panettone	Sweet, rich yeast bread flavored with raisins, citron and lemon rind	Baked particularly for family celebrations
	Grissini	A crisp bread stick with sesame seeds	
	Fugazza di Pasqua	Sweet, rich in eggs and butter	Traditional Easter bread
France	French baguette	A daily consumable in France	Shelflife very short - best if eaten within hours of baking
	Natte	Sweet, rich egg bread resembling challah	Contains gruyere cheese
Germany	Pumpernickel	Heavy and dark	Made with molasses, cocoa rye and bran
	Hutzelbrot	Black yeast bread using sourdough rye	Contains dried apricot and prune or citron
	Stollen	A traditional sweet bread	
England	Sally Lunn	Yeast bread, sweet and rich	Generally baked in a tube pan
	London bloomer	Sweet	Characteristic cross on top
	Crumpet or currant bread	Like soft English muffin	Fried on a griddle in a ring
Ireland	Freckle bread	Made with mashed potatoes and raisins	
	Barmbrack	Sweet spice bread with cinnamon, allspice, lemon or orange rind and raisins	A little treasure or ring is baked in the center of this one
Portugal	Broa	Round yeast bread that includes corn flour	Rich sweet bread made with crème fraîche
Greece	Vasilopeta	Rich sweet bread with cinnamon, anise and coriander	Served traditionally on New Year's Day
	Lambropsoma	Spiced bread with allspice	Served at Easter
	Tsoureki	Spiced bread with masticha (Greek flavoring)	Served at Easter
	Mint bread	Flavored with mint, onion and black olives	
	Christopsoma	Flavored with anise	Very rich in eggs

Country	Name	Description	Comments
Denmark	Kringle	Sweet almond-filled bread	Served on holidays
Finland	Suomalairuisleipä	Their famous dark rye	
Norway	Lefse	Made with mashed potatoes	Griddle fried
	Flatbrod	A baking powder bread made with whole wheat and cornmeal	
Sweden	Limpa	Well-known rye with orange peel and anise	Served on holidays
	Lussekätter	Yeast buns with cardamom and baked in an S-shape	Lucia buns served by the oldest daughter of family at December light festival
Belgium	Cramique	Egg-rich raisin bread	Like French brioche
Poland	Biaylstocker bagels	Chewy, dense unpretentious bagels	Have onion topping
	Vanocka	Sweet bread with candied fruit, raisins and almonds	Served at holidays
Hungary	Krumplis kenyér	Yeast and sourdough bread	Contains potato and caraway seeds
	Lángos	Simple yeast dough with flour, water and salt, deep fried	Batter is consistency of thick pancake mix
	Kalács	Sweetened yeast bread	Served at Easter
	Beigli	Unleavened sweet poppy seed or walnut roulades	Served during Christmas
Bulgaria	Mekitsi	Fried bread with yogurt, leavened by yeast and baking soda	Made into an elastic dough, fried as small disks
Czech	Koláce	Made with prune, apricot or poppy seed filling	Holiday bread
Slovenia	Potica	Sweetened, walnut-filled	Holiday bread
Russia	Chorny hlyeb	Heavy, nearly black bread made with rye and bread crumbs	Sometimes include bran, cocoa, fennel, caraway seeds, ginger, molasses
	Kulich	Sweet, highly decorated	Served at Easter
Middle East	Pita bread	Flat yeast bread with a pocket formed in the oven by a large air bubble	
	Lavash	Yeast bread baked in small flattened rounds in very hot oven	
India and Pakistan	Chapatis	Unleavened whole wheat bread	Cooked on hot griddle without oil

Country	Name	Description	Comments
	Puri	Deep-fried chapatis	
	Paratha	Part white flour and added butter, fried in ghee	Similar to chapatis
	Naan	Yeast bread similar to pita or lavash, also baked in hot oven	May also be made with baking powder
USA	Boston brown bread	Baking powder bread made with whole wheat, cornmeal, molasses and raisins	
	New Mexican anise bread		Unknown origin
North American Indian	Corn bread	Both yeast and chemically leavened breads (leavening obtained from ash of certain plants)	Yeast was made from cooking potatoes, corn and sugar into a dough and fermenting the mass
	Piki bread	Made with thin corn gruel and ash	Poured on very hot flat stones and peeled off like a thin pancake as soon as it sets
	Adobe bread	Made with yeast and wheat flour	Baked in hot adobe ovens
	Flour and corn tortillas		Adopted by Indians from Mexican kitchens
	Indian fry bread	Made with baking powder dough	Fried like a tortilla
Canada	Bannock	Whole wheat flour, baking soda, sugar, herbs	Northern Canadian Prairie Indian Bread
Cuba	Cuban bread	French-type yeast bread with white flour	Baking starts in cold oven
Caribbean	Cassava bread and coconut-banana bread	Sweetened baking powder breads using cassava, coconut and banana	
Mexico	Tortillas, wheat and corn flour	Unleavened	
Paraguay	Sopa Paraguaya	Leavened with baking powder and flavored with mild cheese, cottage cheese, onions and spices	Sopa means soup - reason for calling this bread soup is unknown

Most of the breads in the table are oven-baked, but cooks and bakers may also fry some traditional bread dough in doughnut-size pieces. Deep-fried bread dough is wonderful and appears in various forms throughout the world. The American Indian fry bread, the Mexican *sopaipilla*, the Bulgarian *mekitsi* and the Hungarian *lángos* are examples of simple but delicious crisp-brown crusted, soft and chewy breads that are only good when still warm and fresh.

Bakers make *sopaipilla* and Indian fry bread from a baking powder dough that is stiff enough to tear into pieces for deep-frying. They make *lángos* with yeast that gives it the exquisite

flavor, a combination of yeast bread and deep-frying. Its batter is the consistency of thick pancake mix. It is a no-knead batter, so it only takes minutes to combine the dough. After rising, the cook stretches doughnut-size pieces by hand before it is slipped into hot oil.

The Whys and Hows of Bread Dough

Many practical cooks create with their hands and verify the result with their taste buds. They modify their creations according to what their taste buds tell them. They have little interest in what happens during the process of preparing and cooking that dish as long as it tastes right.

But it is useful to know that *all* our cooking and baking is no more than a series of physical and chemical changes within the basic ingredients induced by your actions. For instance, when you stir, apply heat on the stove-top or in the oven, or add a substance like vinegar, you induce changes in the chemical or physical makeup.

Of the large number of cooking and baking techniques you undertake in your kitchens, there are a few where your understanding what is happening is helpful if you want the best. Bread baking is one of them. Understanding the basics behind the process can be an enormous help in producing a good bread. And in the unlikely case of a failure, you can pin down the problem if you understand the process. Many accomplished cooks refuse baking breads thanks to some failed loaves in the distant past, an obvious embarrassment to their cooking ego. Yet it is an even more embarrassment not to be able to put a fabulous fresh yeast loaf on the table.

There are a number of good bread-baking books on the market. Most give no more than recipes and describe bread-making techniques. Some are accurate, others must have copied the information from another source without the bother to understand it. To illustrate, the author of an otherwise excellent book on bread baking used the words yeast and bacteria interchangeably. The two organisms are not even second cousins. The only common thing between them is that they are both microscopic in size.

So let's talk about the whys and hows of breads. Breads are either unleavened or leavened. Without yeast (commercially produced or wild from the air), breads are unleavened that bake into the Mexican tortilla, the Indian chapatis or the Jewish matzo, to mention a few. None of these are particularly tasty enough to eat by themselves. The texture, structure and flavor yeast imparts to the baked dough is absent from these unleavened breads, leaving them figuratively and literally flat.

Try to bake a bread dough without yeast in a loaf pan. You end up with a heavy crust on the outside and partially baked or unbaked dough inside—an inedible, heavy lump, good only for throwing or as a door stop. The dough must be leavened before it becomes edible bread.

Leavened bread are in two major categories, based on what makes it expand: quick breads and yeast breads.

Quick Breads

Quick breads are made from batter in which the leavener, that mysterious ingredient that creates bubbles for airy lightness, is either baking powder, baking soda, or a combination of both. We bake quick breads in bread pans, as we do the familiar zucchini bread, but muffins, scones and biscuits are also brothers and sisters to quick breads. For true quick breads the batter is thin enough that you can just barely pour, for biscuits it is thick enough that you can roll out—it is all the matter of liquid to flour ratio.

Chemical leavening—baking powder—was developed in England around 1835 as an

alternative to the ancient tradition of yeast leavening. Baking powder first became available commercially in 1850.

TASTINGS Before baking powder

Baking powder had a predecessor—ash. Ash is an alkali which produces gas in contact with acid and liquid, leavening the bread the same way as baking powder. Native Americans leavened breads with ash left after burning the woody parts of specifically selected shrubs.

When introduced, some contemporary scientists hailed chemical leavening as a healthy alternative to yeast that they had thought was harmful to humans. As a result its popularity spread fast. This was particularly so after the French Pasteur's discovery in 1857, that it is a microorganism that causes yeast fermentation. Chemical leavener has been on our kitchen shelves ever since. It is not actually an alternative to yeast but another, quicker, easier means of producing wonderful baked products.

The idea of chemical leavening is simple. A harmless alkali chemical (sodium bicarbonate or baking soda) produces carbon dioxide gas. The thick dough traps the gas that gives the bread a light, airy texture. The chemicals, if you use just the right amounts, are neutralized in the process, leaving neither a bad flavor nor harmful residue behind in the bread. The wonderful yeasty favor (which is the by-product of yeast feeding on sugar) is missing, of course, but some people actually prefer quick breads. In the Southern U.S. cornbreads and biscuits are standard fare, still favored over the second best, the store-bought "light bread"—the commercial white bread introduced in the 1940s.

Originally bakers added baking soda to the slightly acidic bread batter made acid with sour milk, buttermilk or yogurt. The liquids produce a chemical reaction with the alkali baking soda, a reaction that produces carbon dioxide bubbles. Without the acid part you cannot leaven bread with baking soda. The next step in evolution was baking powder, an improvement over baking soda. Baking powder is a mixture of baking soda and cream of tartar crystals. Cream of tartar is an acid so bubbles develop in the dough or batter even if you add no other acidic liquid.

The finely-ground crystals of cream of tartar powder dissolve quickly, produce an acid when you add liquid to the batter or dough. In the same time baking soda goes into solution. Together they start a chemical reaction that produces a salt, carbon dioxide gas and water in the bread batter. Once you trap the carbon dioxide gas, you guarantee a light bread.

Baking powder is a simple mix and should you ever run out you can make your own. Mix cream of tartar and baking soda at a ratio of 2:1. Commercial baking powder has several other ingredients, but they only increase shelflife and prevent clumping.

Double acting baking powder, an ingenious invention, is the next improvement over the original baking powder. It is the type most widely used today. Double-acting baking powder is a blend of two chemicals, both of which generate carbon dioxide gas. One chemical generates it at room temperature as soon as you moisten it with the liquid ingredients. The second develops bubbles only when the batter reaches a certain temperature. This happens in the oven during baking.

The first reaction is mild, creating small bubbles throughout the batter. The second one only starts its more vigorous work after the batter has partially solidified in the oven so the quick burst of new gases will not disturb the existing structure, either cracking the surface or collapsing the entire dough. This second action enlarges the bubbles of the original set.

Yeast Bread

The leavening agent for the second major category of bread is a microorganism, yeast. Yeast dough is considerably thicker than quick bread batter, thick enough that you can manipulate it by hand. An essential part of yeast breads is gluten, that forms a structural framework for the bread, something comparable to the steel framework of a modern building. Gluten is an organic material that forms in the flour with moisture. It is this gluten structure that traps the gas that yeasts give off—without this trap our bread would be heavy and flat. Yeast lives on sugar that it converts into alcohol and carbon dioxide gas. While the gas remains in the dough, the alcohol escapes as it evaporates during baking.

Let's take a closer look at the two basic ingredients in yeast breads.

Yeast

You take millions of lives while you are braking that wonderful, fresh irresistible yeast bread. You are a veritable mass murderer. You bring the tiny, dormant dry yeast cells to life in warm water, give them nutrients and prime, luxurious environment to grown in and multiply. Finally, when they tripled and quadrupled in numbers and they consider you as the greatest friend and benefactor they ever had, you kill them all in one terrifying moment in the heat of your oven. If you carefully listen by your oven door, for a brief, disastrous moment you may hear their last sickening screams as they unwillingly give their lives for your eating pleasure.

Yeast is a single-celled organism, a microscopic fungus related to mushrooms. Being a fungus, yeast requires no oxygen to live and multiply. In fact, too much oxygen interferes with yeast activities.

There are two types of bread yeast, both belong to the same species but are of different genetic strains. For the home baker, fresh compressed yeast comes in small refrigerated packets. It is fully alive but chilled to the bone—and so would you if you were sitting in the refrigerator wrapped in nothing else but foil for weeks. But warm it up and it is instantly ready to work in your bread dough.

This strain of yeast has little tolerance for either too cold or too hot temperatures. If you are not reasonably exact, you either do not activate the cells in too cool water or kill them with too much heat. Fresh compressed yeast acts faster and is cheaper than dry yeast, so commercial bakeries prefer it. Otherwise it produces exactly the same breads as the second strain, active dry yeast.

Dry yeast requires no refrigeration. The living cells are dehydrated and dormant—not dead, but not active until you provide an environment that yeast likes. Dry yeast only takes a few minutes longer to activate in warm water than fresh yeast. It has a wider tolerance for variation in the temperature of water, so it is particularly suitable for home bakers who don't have as close a control as bakeries do.

You can buy dry yeast in tiny individual packets or large containers, even in bulk in well-stocked health food stores. If you use yeast fairly often, buy it in large amount and keep it in the refrigerator or freezer. If frozen, it remains active for many years. The one or two tablespoons that you take out at a time defrosts in seconds.

You want to give your little slaves, the yeast cells, the best opportunity in life. In return, they will work as hard for you as they possibly can. Let's just use the always readily available and easy to use dry yeast strain.

Start with waking them up from their long sleep. They love the scorching Death Valley

temperatures of between 105º and 110°F (41º to 44°C). The packages may only tell you to use very warm water (most home bakers don't own an accurate thermometer), but try to give the yeast ideal conditions, measured with a thermometer. The yeast's work decreases dramatically at a low temperature, and a temperature above 140°F (60°C) kills the organism. But when you bake often with yeast, eventually you will have a feel for 110°F (44°C) water and you may leave your thermometer in the drawer.

A rapid-rise yeast is made for people who have no time to wait for the regular yeast to act. Many bakers think that rapid-rise yeast acts too fast and won't produce quite as good a bread as regular yeast. Others prefer it not only because it acts faster but because the faster action discourages other microorganisms to develop in the dough along with the yeast during fermentation. These foreign microorganisms generally produce a slight sour taste in the bread. For this reason some bakers say that with rapid-rise yeast the breads taste sweeter. For other bakers that is a disadvantage—they prefer the barely detectable sour flavor. Take your pick.

TASTINGS What is rapid-rise yeast?

A rapid-rise yeast is a slightly different, even faster-acting strain than the common dry yeast with a more open, more porous structure that quickly absorbs moisture. The yeast maker may slowly air-dry, instead of oven-dry, rapid-rise yeast at lower temperatures so more cells remain alive in the package you buy thus they act faster. You add rapid-rise yeast directly to the dry ingredients instead of first dissolving it in liquid. Though it works faster, and many cooks swear by it, you would not taste a noticeably difference from breads that common dry yeast leavens.

Yes, you can bake a yeast bread without the yeast. The role of the yeast, after all, is to produce the bubbles in the gluten structure. Mechanical action can also produce bubbles. Large commercial bakeries don't have time to wait for the slow action of the yeast. Huge, powerful machines whip air into the bread dough, and without further ceremony bakers put the bread into gigantic ovens for baking. They only add yeast to give the dough the characteristic yeasty flavor.

Yeast is finicky about its environment. Besides heat, it loves sugar, while it dislikes salt and acids. It doesn't mind a small amount of spices but too much suppresses its activities. For example, if you add too much cinnamon in your cinnamon-raisin bread, your slaves become sluggish.

Some spices, interestingly enough, enhance yeast activity. For instance, German bakers used to add a small amount of dry ginger to their dough. They didn't know why but yeasts became more active. Today food scientists proved in their laboratories that, indeed, yeast prefers its foods spiced with ginger (and a few other spices), and they become harder-working slaves.

As a general rule, use no more than ¾ teaspoon of spice for every 2 cups of flour in the dough. If you like more spice, either knead it into the dough just before shaping (after the yeast finished most of its work), or use it in a topping or filling.

Whenever you substitute honey for sugar in sweet yeast breads, there is another possible problem that occurs occasionally. Some raw honey contains a natural antibacterial agent, a substance that also kills your yeast. There is no way to know which honey does. Pasteurized honey is always safe.

Yeast favors a monotonous diet of nothing but sugar—for breakfast, lunch and dinner. It even snacks on sugar. But too much sugar as in a sweet bread dough slows yeast down, even stops its activities. Sugar is hygroscopic, that is, it holds on to water. What happens is that too much sugar

in the batter simply ties up the moisture and there is not enough left for the yeast. You should not add more than 2 tablespoons sugar for every cup of flour in the dough. An additional problem of too much sugar is that it interferes with developing gluten. Sugar combines with the gluten-forming proteins so gluten cannot fully develop.

Bakers add extra yeast for high-sugar breads to compensate for their slow activities, they knead the dough longer to develop as much of gluten as possible and they use the highest protein flour they can get. Another way to get around the high-sugar problem is to keep the dough just barely sweet and add sweet fillings and toppings once the dough is fully proofed.

Although flour in the bread dough does not contain sugar, it has plenty of starch and our smart yeast knows how to convert starch into sugar that it proceeds to gobble up with enormous appetite. Fortunately for them, there is an enzyme in flour (*alpha amylase*) that, on command from the yeast, converts starch into simple sugars. These enzymes attack starch granules damaged by the milling process. Commercial bakers add barley malt to bread dough as it has a high amount of the enzyme that accelerates this conversion. When you read the list of ingredients on your bread wrapping, malt, malted flour or barley malt is likely to be one of them. The enzyme in them is the reason.

In the feeding process yeast produces the gas carbon dioxide which remains in the dough as bubbles. In the oven heat the dough solidifies, and the gas bubbles become the holes in the bread. Another reason for yeast is flavor—yeast gives the unmistakable, marvelous yeasty taste to breads.

Flour

Flour contains five basic organic building blocks: proteins, starch, sugar, oil and enzymes. Sugar and starch are the yeast's basic foods. Oil is in the wheat germ providing energy for the sprouting wheat. The wheat germ remains in whole wheat flour but the milling process removes it to make white flour which is free of oil. Enzymes are very minor constituents of flour.

There are many proteins in flour that are its main ingredients. Only two are important to develop the bread structure—*gliadin* and *glutenin*. These two proteins become *gluten* when you add water, but that is not enough for developing bread dough. In order to form a proper structural framework that becomes bread, gluten must be developed by kneading. Kneading lengthens the gluten molecules so they can produce a firm, continuous structure. Gluten then becomes a rubbery, elastic chemical that forms a network in the dough.

TASTINGS How to make pure gluten

Even to experienced bread bakers gluten has the aura of a mysterious substance that forms like magic in kneaded bread dough. But gluten is a physical substance, nothing mystical. You can make gluten, see what it looks like and feel it in your hand. Prepare and knead a bread dough using bread flour until it is soft and supple, indicating that you have fully developed the gluten. Now continue manipulating the dough under running water. The water washes the starch out of the dough, and when it runs clear and all the starch is down the drain, you have pure gluten in your hand.

Bakers know that the rougher they are with the dough, the faster and better the gluten develops. What kneading does is unfold and align the randomly oriented and twisted gluten

molecules. Continued kneading lines the molecules up into parallel sheets that trap the carbon dioxide, and the air holes you see in your baked bread were all these trapped bubbles. When these sheets develop to the maximum extent, the dough changes its appearance from a gooey, sticky mass to a smooth, elastic, somewhat stiff ball that holds its shape. Fully developed dough remembers its former shape. When you gently dent it with a finger, it slowly springs back like a balloon. (Some bakers say that a developed dough should feel like your earlobes.)

The flour you use to make bread must have high enough protein content to develop gluten sheets in the dough. Flours range from soft to hard, terms that describe the starch content. The more the starch, the less the protein. Soft flours are high in starch, low in protein, hard flours the opposite. For bread you want the high-protein hard flours. For general baking purposes, flour mills blend various types of flours to produce a single flour suitable for most household cooking and baking purposes. This compromise product is our all-purpose flour. You can use it for bread baking but you don’t get the best, highest-rising breads with it.

Commercial bakers are careful to use the optimum flour for every type of baking, but home bakers have less choice available. Bread flour is now on most grocery store shelves, but should you not have it in your community, you have a couple of options. Ask at the local bakery if they will order an extra 50-pound bag of hard-wheat bread flour the next time they re-order their supply. If the baker is honest, the price is very reasonable, and 50 pounds (23 kg) of flour produces 45 to 50 loaves of bread. Baking two loaves at a time, that is not an unreasonable amount to store. Flour has a long shelflife if you keep it well covered in bins in a fairly cool, dry place, out of reach of tiny bugs and insects.

Your other choice is to buy all-purpose flour and add gluten flour to up the protein content. Gluten flour is wheat flour from which they remove most of the starch, leaving behind a concentration of gluten proteins. You can often find it in bulk at health and natural food stores. It is costly but you need very little to make a good bread flour blend (5 percent gluten and 95 percent all-purpose flour). A loaf that calls for 3 cups of flour needs only 3 tablespoons of gluten flour.

One of the baking tests I conducted for this chapter was baking three identical breads with three different flours: hard-wheat bread flour, all-purpose flour and all-purpose flour with 5 percent gluten flour. All three breads tasted the same, but the difference in the loaves was clearly visible.

The loaf I made with bread flour rose the most and held its shape the best when baking free-form on a baking sheet. The loaf I made with all-purpose flour plus gluten flour held its shape less well. It flattened a little and had a somewhat heavier texture. The all-purpose flour loaf flattened clearly during the last rising and baking, and the air holes were much finer than in the other two loaves.

Modern flours need no sifting before mixing them into bread dough. You can measure flour directly from the bin to the mixing bowl or on your work surface. It is always surprising to see in a new cookbook that the author still starts bread baking with the familiar, "sift dry ingredients into a bowl." Sifting is still a good idea if you have several dry ingredients that need mixing, as in quick breads. For yeast breads with few ingredients, forget about sifting.

Another misconception is exact measurements. A reasonable accuracy is fine, but you don't need to draw a knife over the cup of flour. Yeast, salt and flavorings need to be exact in measurement. You don't need to be quite so careful with the flour and water.

Other kinds of flour

Besides our basic, standard degerminated white flour, whole wheat and rye flours are the

types we most commonly use in breads. These two are both low in the two proteins that produce gluten, so without the addition of white flour, they bake into dense, heavy, fine-textured breads. Blending in 20 to 50 percent white flour lightens the loaves significantly, and they still remain whole wheat or rye breads, respectively.

Whole wheat bread, even with the addition of white flour, is never very light—it is hearty with very good flavor. This flour includes the germ and the bran of the wheat grain. The germ is a tiny starch and oil-rich portion from which the new plant germinates, while the bran is the outer covering surrounding the grain that protects and seals in the inside. These two, germ and bran, are what lend the lovely flavor yet hinder light and airy texture.

The wheat germ contains oil that turns rancid, especially when you store it in a warm place. Any flour that includes germ, such as whole wheat, has a relatively short keeping quality. If you keep the flour for more than 6 months, it is best to refrigerate it in warm weather, or at least keep it in a very cool place. Rye flour has no oil and you may keep it for years, just like white flour.

Many yeast breads improve in flavor with the addition of 10 to 25 percent whole wheat flour. This amount is not large enough to increase the density of the bread much, but it does darken the color and give it a richer, nutty flavor, plus added nutrient of the whole wheat.

Oat and barley flours have excellent flavor but since they don't contain gluten-forming proteins, they produce especially heavy, dense breads. If you like to bake with either of these flours to include their wonderful flavors, it is best to add only small amounts to your dough, no more than 25 percent, to retain light texture. Graham flour is a coarse-ground whole wheat flour. You may substitute graham for whole wheat flour one for one.

Chili pepper bread

Chili pepper bread is alive with a slight pungent bite of chili and unusual with a soft pale vermilion color. You control the amount of chili—2 tablespoons the recipe calls for produce a pleasant bite. This bread is particularly well-suited to accompany a high-flavor meal or for lunch with sturdy sausages and cheese. Its flavor would overpower mild foods and it is definitely not suitable for the first meal of the day (though it is surprisingly good with butter and jams or marmalades).

Ingredients

¾ cup very warm water
2½ teaspoons dry yeast
½ teaspoon sugar
1 egg
¼ cup vegetable oil
5 cups bread flour
2 teaspoons salt
2 teaspoons sugar
2 tablespoons medium-hot ground chili
cornmeal to sprinkle baking sheet

Procedure

1. Sprinkle yeast and ½ teaspoon sugar in water and stir well. Let yeast proof for 5 minutes.

2. In a small bowl, beat egg with oil.

3. In a large bowl, mix flour, salt, remaining sugar and chili. Combine with dissolved yeast in water and oil-egg mixture. Form a dough, adding little more water until the dough is neither sticky, nor dry. Knead by hand or machine until smooth and supple, about 10 minutes by hand, 4 minutes in an electric mixer, 1½ minutes in food processor. Dust dough with flour and let rise in a warm place in plastic bag or covered bowl until double, 60 to 75 minutes.

4. Sprinkle a baking sheet with cornmeal. Knead dough another minute, cut into two, then cover and let rest for 10 minutes. Shape each half into a loaf (long or round), and place on baking sheet at least 3 inches apart. Cover with moist towel and let rise again in a warm place until nearly double, about 30 to 40 minutes. In the meantime, preheat oven to 400°F (205°C) with a pan of boiling water on bottom shelf.

5. Slash and spray surface of dough with water. Bake 30 to 40 minutes until brown and crusty, and sounds hollow when tapped on the bottom (or internal temperature is 190°F or 90°C). Cool on wire rack at least 20 minutes before slicing.

Why do they treat flour?

We discussed above how flour mills make white flour by removing the germ and the bran. But flour mills may also bleach flour, and on the shelves you have a choice of bleached or unbleached flour. Is bleaching necessary? What does it do? Which one should you buy?

Flour mills introduced the bleaching process in some distant past for the sole purpose of whitening the flour. Without bleaching, the flour has a yellowish tinge due to a natural pigment (*xanthophyll*, a carotenoid pigment that potatoes and onions have). The general public, or at least the promo people at the flour mills, considered snow-white flour and snow-white breads purer, thus better. Bleaching is purely cosmetic. Although it is not harmful, it destroys the small amount of natural vitamin E (the amount is so small, the loss is nutritionally not significant). Flour mills, however, enrich all white flour with vitamins to compensate for those they lose in bleaching and degermination. Interestingly enough bleached flour, that undergoes less processing, cost a little more than unbleached. The reason, according to flour mills, is the less demand for it that ups the price slightly.

Even if you prefer a flour with no chemical treatment, unbleached flour is not the answer—it still undergoes a chemical treatment before arriving on your store shelf. Freshly milled flour doesn't produce a satisfactory baking product. It contains organic chemicals (thiol group) that interfere with producing a pliable, elastic dough. Flour needs to age for a while. Without aging, the gluten will not form a strong cohesive bond.

In the past, flour mills aged flour in storage for a month or two before selling it to distributors. During that aging period the offending chemicals oxidize and they no longer adversely affect dough quality. Pigments also oxidize to form light-colored products, thus the flour turns white. Today such long-term storage is too costly. The milling plants accomplish what aging does in minutes by treating the flour with chlorine dioxide gas, a process called *chlorination*. Your chances of buying flour completely free of chemical treatment are not good. If you really want pure, natural flour with no chemical treatment, buy yourself a wheat farm in North Dakota and a large, powerful grain mill.

What else you can add

When you add cornmeal, wheat berries, oatmeal or rye flour, or vary the proportion of several flours within the dough, you change the texture and flavor of the bread. You can further enrich the dough by adding flavor-rich foods such as milk and egg. You can change the flavor by adding potato or caraway seeds, fennel seeds or herbs, among other things. Only robust, strong-flavored spices and herbs are effective—the essential oils of milder herbs evaporate during the baking process. Some bread recipes use onion and cheese, others carrots, raisins, cranberries; there is virtually no limit to what you can legally incorporate. But the best bread to all of us, bread purists, is plain ordinary crusty, chewy bread with very little or no addition.

The cooking water for potatoes is full of nutrients and starch. It is a great substitute for water in the dough, providing extra nutrition for both you and the yeast and it also adds a richer flavor. So reserve this water in a jar after you drain the potatoes, and keep it in your refrigerator. Next time you bake bread, instead of using warm water from the tap, measure the needed amount from this reserve, heat it up to the required 105 to 110°F (41 to 44°C), add the yeast and proceed as usual. However, reduce the salt slightly in your bread dough to compensate for the salt in the cooking water. Don't use cooking water in which you cooked unpeeled potatoes—it includes unwanted flavors and possibly toxins.

What makes sourdough bread sour

Sourdough is also a yeast bread, but in a true sourdough the yeast is natural, wild yeast from the air, not from a package. It is not the same strain of baking yeast we find on the supermarket shelves. Commercially produced yeast detest sour environment and doesn't develop happily in it.

Yeast cells exist everywhere in the air and soil, and many natural yeasts are suitable for producing carbon dioxide bubbles in the bread dough. These wild yeast strains enjoy and thrive in acid conditions of the sourdough. As soon as you prepare a dough with flour and water, yeast cells flock to it, congregate in it to feed on their favorite food, sugars.

The sour taste of sourdough bread, however, is not the result of yeast activities but to bacteria, also natural in the air, that also invade your bread dough. Yeast cells multiply fast and they start fermentation within hours if the temperature is favorable, but bacteria need several days to build up enough lactic and acetic acid to give the characteristic sour flavor. That's why real, natural sourdough must rest for several days.

The first step of making sourdough bread is to develop a sourdough starter, what professional bakers call *levain*, that you can use over and over again. The starter consists of flour and water mixed to make a very soft, almost liquid dough. The ratio is about a ½ cup flour to 1 cup water. Don't add salt to this starter because it interferes with yeast development. Yeast doesn't like salty environment. Let this dough stand in your kitchen to invite the appropriate yeast and bacteria from the air. They multiply in the dough and develop both leavening power and a sour taste within a few days.

When you are ready to bake a sourdough bread, divide the starter into two half portions. Use one half to make your dough, replenish the other half with flour and water, then put it in your refrigerator for the next bread's starter dough. If you bake often and sourdough is on your menu frequently, you want to have your starter at the ready. If you rarely bake sourdough, the starter may get too old to be usable by the time you need it again. You can refresh it, but you have to plan a few days ahead.

Sourdough starter won't work in every location. The famous San Francisco sourdough owes its existence to the city's cool, humid climate and a strain of yeast present in the city's air. If you don't live in San Francisco or in similar sourdough-friendly climate, you can bake a compromise sourdough bread. Add dry yeast to the starter to kick-start the action. A combination of dry and natural yeasts leavens the resulting bread with some bacteria from the air for the sour flavor. The starter is ready in a couple of days, several days makes it even more sour. But don't expect a real sourdough. The large commercial bakeries go even a step further in compromise—they prepare a common yeast bread dough and add the sour taste, usually ascorbic acid. Read the ingredient list next time you buy packaged sourdough bread. If ascorbic acid is listed, your sourdough bread is a fake.

TASTINGS The sourdoughs of San Francisco
A group of San Francisco microbiologists investigated sourdough starters and found that there appears to be some truth to ancient sourdough starters that people treasure for decades without weakening or spoiling . They found that these decades-old starters may have developed a community of two types of microbes, yeast and bacteria, in perfect equilibrium with each other, including a sort of antibiotic action that excludes other microbes and resists outside contamination.

As the starter ages, it becomes contaminated by other not-so-friendly bacteria and as a result, your starter becomes too acidic or too off-flavored. Then you have to start over again from scratch.

Baking the Bread—What Heat does

Baking seems simple to us: put the well-risen, proofed dough in the hot oven and take it out when it is fully baked. If all went well (and there is no reason why it shouldn't), we place a still-steaming, irresistibly-perfumed, brown-crusted, mouth-wateringly beautiful loaf of bread on a wire rack, and we are ready to cut into it after a short cooling period. But the baking process is anything but simple. There is a series of very complex chemical reactions and physical processes that happen during bread baking, so complex that even food scientists who have studied the baking process for decades are far from fully understanding it. For our purposes as home chefs we don't need to know more about these complex reactions than the very basics which are simple.

In a nutshell, here is what happens in the oven. There are three stages of baking.

1. The first stage covers the first quarter of baking time, until the temperature of the dough reaches 140°F (60°C). That is the temperature when the yeast cells die. Up to that point the rising heat keeps the yeast more and more active to produce a great amount of carbon dioxide gas. All the gas trapped in the dough now expands rapidly as we still remember from our physics class—heat expands gases. Another thing happens, too. The by-product alcohol the yeast produce after gobbling up the sugar evaporates and turns into gas in the hot oven. The result? Even more gases in the dough.

As a consequence, the dough expands rapidly. Bread bakers call this process *oven spring*—the bread dough springs up. Anticipating oven spring is the reason why you don't let the dough fully double in the last rise. If you allowed the dough to rise too much, the expanding gases during oven spring may rupture the barely solidified gluten structure, and the loaf may partially deflate. Also, if you let the dough rise too much, its structure becomes too unstable, and even such last-minute

action as slashing and glazing may partially deflate it. Should that happen to you, don't trash the bread—it is still edible but a little dense and too firm. It may still be fine for toast.

At the end of this first stage the gluten begins to coagulate and the starch to gelatinize. Both processes are changes from soft, flaccid phase to firm and solid, and both occur at close to the same temperature, about 145°F (63°C). Once both gluten and starch are solid, the oven spring ends, the structure cannot expand any more—but by then the yeast cells are dead and they cannot produce more gas anyway.

2. During the second phase of baking, that makes up about one-half of the total baking time, the structure becomes more solid, progressing from the solidified crust toward the center. This phase is over when the center finally also turns solid. In the same time, near the end of the phase, the top crust begins to brown.

3. In the third phase, the final quarter of baking, the top surface dries out and turns brown. These two processes form that splendid crisp crust of a fresh-baked bread. Even though browning only takes place on the thin outer surface, it affects the flavor of the entire loaf because the flavors (produced by the browning reaction) disseminate inward. To prove the importance of this stage, try baking one light-colored and one dark-colored loaf from the same dough. The darker one will have noticeably more flavor. When knowledgeable housewives bought their breads in European village bakeries, they always asked for the darker loaves.

Staling

Even though fresh bread tastes wonderful for many hours after baking, the staling process in both quick and yeast breads starts with the cooling phase.

One reason for staling is loss of moisture. But even if you seal the moisture in completely in heavy plastic bag, staling still goes on because of chemical and physical reactions in the gelatinized starch. Commercial bakers use emulsifying agents to increase their products' shelflife, agents that slow the chemical reactions of staling.

One advantage to home baking is that you can take steps to preserve your freshly baked loaf without chemicals. But first we need to know what staling is.

Because the process is a chemical reaction, it is very temperature-dependent. Most chemical reactions proceed faster as the temperature rises. Staling doesn't follow this rule. It proceeds fastest in the temperature range just above freezing which is very close to the temperature of the inside of your refrigerator. Staling is very slow below freezing and nearly stops at deep-freezing temperatures. At room temperature bread stales relatively slowly.

What does this mean in practice? That the worst place for a loaf of bread (unless you need stale bread for tomorrow's turkey stuffing) is in the refrigerator. Letting it sit in a plastic bag on your counter is much better. The best spot is in your freezer and the colder, the better.

That is why supermarkets never store breads in the refrigerator. Large commercial bakeries toyed with the idea of putting labels on their bread wrappers warning consumers not to refrigerate to preserve freshness. They opted instead to load their breads with staling retardants for extra-long shelflife.

One more fact you need to know about staling. It is a reversible reaction. Heating the stale bread to 140°F (60°C), near the starch gelatinizing temperature, reverses staling, and the bread nearly restores to its original texture, crispness and flavor. Since some moisture loss likely to have occurred and more moisture evaporates during reheating, sprinkle the bread liberally with water before heating. A moderate oven of 350°F (180°C) for 8 to 10 minutes is best for

breads, 4 to 5 minutes for rolls. At this temperature even the crisp, fresh-tasting crust should reappear.

Bread Baking for the Home Chef

Appearance and presentation are all-important in contemporary North American dining rooms. The truth is, we consider bread almost like a glass of water by our plates, a standard fare. You can bake a wonderful bread that looks like a showpiece in a classy baker's window, yet few of your guest stop dinner conversation to ooh and aah when you bring in the bread basket filled with a spectacular, warm Italian Tuscan bread you just pulled from the oven. Few even ask if the bread is your own. But a perfectly arranged and color-coordinated dinner on a plate, an artistically composed salad or a simple decorated poppy seed-chocolate torte will stop the most heated discussion, even if only for a moment. A major reward you do get from baking your own bread is satisfaction in performing this seemingly demanding task and, of course, savoring it.

As far as difficulty is concerned, if you are organized, you keep your basic staples on your shelf replenished, and have a basic kitchen experience, you can assemble a quick bread batter in 15 to 20 minutes. By the time you pour the batter in the pan, the oven is hot, and in 40 minutes you have the loaf cooling on the counter. It is ready to cut, butter and eat in another 15 minutes. Actual work time is 25 minutes, including slicing and cleanup.

Yeast breads take a considerably longer time, but surprisingly not much more total work time once you are a regular bread baker. To assemble the ingredients and knead the dough takes 15 to 20 minutes, less if you use a food processor or mixer. The first rise takes about 1 to 1½ hours. It takes only a few minutes to punch down the dough, shape it and place it in a pan for the second rise, which takes some 40 to 50 minutes. A bread bakes in another 40 to 50 minutes, rolls 15 minutes. Total time is over 3 hours, but your actual working time, including slicing and cleanup, is about 25 minutes when hand kneading or 15 minutes when using a machine. Is this realistic? Once your bread baking is routine, it is and you can prove it to yourself.

Is yeast bread worth the wait? You bet! Other culinary achievements that rival the satisfaction of baking a great bread is stirring up a wonderful, hearty soup or baking a spectacular cake.

Baking Quick Breads

Anyone with a bare minimum skill in the kitchen can master quick breads. If you don't make a mistake in following the recipe, if your ingredients are not ancient (especially the baking powder), if your oven temperature is within 25º of what the dial indicates and if you take the bread out of the oven on time, you've mastered quick breads.

The variety of quick breads is enormous depending on what flavoring agent you use. From fresh or dried fruit to vegetables, nuts, or often a combination of these are examples. The type of flour and fats or oil, the liquid and the sweetening agent also vary. Eggs not only hold the bread together but enrich it in flavor and nutrition. Plain quick breads without at least some added flavorings are too bland, yet they are fine to accompany a meal with butter and perhaps jam, marmalade or honey.

All quick breads use the same type of viscous batter. Preparation is user-friendly, ideal for beginners in the kitchen, even young children. Combine all the dry ingredients in a sifter, including dry flavorings like cinnamon and nutmeg, and sift into a bowl. Combine all liquid ingredients, including eggs and any liquid flavorings like vanilla in another bowl, then lightly mix the wet into

the dry. You may add chopped fruits, nuts, grated vegetables or whatever the recipe calls for at any time in this process. An important part is to mix lightly, just until the ingredients are combined. To much mixing toughens the final product, and that is about the only thing you have to be careful about. Too much mixing is beginners' downfall and the bread turns out dense and dry. Never use a food processor to mix a quick bread dough.

Pour the batter into a greased pan and bake. After it is done, a quick bread is ready to eat it at once, though it is easier to slices if you let the bread cool a little.

If you overbake your quick bread, it gets too dry. If you underbake it, the center is still soft and doughy. Set your timer 5 to 10 minutes earlier than the recipe calls for, and start testing the bread with a toothpick or bamboo skewer at that point. As soon as the tester comes out clean, the bread is ready. A thermometer registering 190°F (90°C) in the center is also a good testing device.

Quick breads don't have a delicate structure like cakes do, they won't collapse or fall when disturbed. You can go ahead and dance in the kitchen while your quick bread is baking, even if your floor is quite bouncy. The bread won't mind it (though your neighbors might).

Why do some recipes call for baking powder *and* baking soda? When a sour ingredient is part of the dough—buttermilk, yogurt, sour cream or sour milk—the dough needs both leaveners. Baking powder was designed for a neutral batter, so if it contains additional acid ingredients, you need something to neutralize it or the chemical reactions are unbalanced. That is what the baking soda does. The sour liquids in the recipe promote a lighter bread and are the basis for another chemical reaction that produce bubbles. Recipes with sour ingredient always call for baking soda.

Should you change a recipe and substitute sweet milk for any of the sour products, be sure to omit the baking soda. You can also substitute sour liquids for sweet, for example, sour milk or yogurt for milk, sour cream for sweet cream. But make sure you add baking soda in the ratio of ½ teaspoon for every cup of the sour liquid. Because the baking soda combines with the sour liquid and generates carbon dioxide gas bubbles, you don't need as much baking powder in the recipe—reduce it slighlty.

The amount of chemical leavening in quick breads is critical. If you don't add enough, you won't get the gas bubbles light breads require. If you add too much, all the chemicals don't completely neutralize during the mixing and baking, and your bread ends up with a chemical or bitter soapy taste. Too little mixing, so you don't distribute the chemicals evenly throughout the dough produces the same effect. You remember the church potluck when that wonderful-looking zucchini bread had such a bitter favor? That is what caused it. Hopefully it wasn't *your* zucchini bread!

Quick bread shortcut

How do you get fresh-baked quick bread or muffins for breakfast without getting up at the crack of dawn? If you bake them the night before, by morning they are no longer truly fresh. Quick or not, their preparation and baking still take time. There is a way.

Mix the dough or batter the night before, put it in the bread pan (or muffin tins), cover and put it in the refrigerator. As soon as you roll out of bed and even before you start your coffee or let the dog out the next morning, turn on the oven and take the pan out of the refrigerator. When the oven is hot, put the bread or muffin pan in. Add an extra 5 or 10 minutes to baking time since the cold batter needs extra time to heat up, like your car engine in January. But before you have had a chance to pour your second cup of coffee, there'll be a slice of fresh, still-warm bread or muffins to dunk.

This method works, but how? The baking powder starts its action as soon as you mix the dough and slowly continues in your refrigerator overnight. You won't lose any bubbles. The rest of the rising happens in the oven with the second set of chemicals in the double-acting baking powder. This method actually produces lighter, better-risen breads and muffins than a freshly-mixed batter.

I encourage you to turn your own kitchen into a testing lab and check it out. Make two identical quick breads. Mix one the night before, the other one just before baking. Bake them together and compare!

Baking Yeast Bread

The difference between quick breads and yeast breads is a matter of taste. Some love quick breads, but most of us would take a good fresh-baked yeast bread any time. Bakeries sell far more yeast breads than quick breads. Though quick breads are neither breads nor desserts, they are great choice for breakfast, brunch or a coffee break. A good, fresh yeast bread, on the other hand, can be a feast by itself. Accompanied by a bit of good cheese or sausage, a pâté or just plain good butter, even fresh fruit, it becomes a nutritious repast. Add a glass of wine and you have a meal that is truly divine.

TASTINGS Fresh, warm bread in minutes
You can parbake bread dough, that is, you partially bake it, then take it out of the oven about 10 minutes before it is fully brown. After cooling you can store the parbaked bread in the freezer or just hold it until serving time. Just before serving you pop it back in the oven and finish baking for an absolutely fresh but quick result. That is how good restaurants serve their warm fresh-baked bread to accompany the meal. Commercial bakers deliver frozen parbaked breads and the cook defrosts enough for the day. He or she pops them in the oven for a few minutes to brown just as the hostess seats you. By the time you order, the warm bread is in the basket. This trick is open to your kitchen but you need to plan ahead.

Even though bread making is relatively simple, it is not like boiling potatoes. There are a few precautions you must be aware of or the bread-baking turns into disaster. Start with a simple bread recipe to practice on. Most breads have only four major ingredients: flour, water, yeast and salt. Even the proportion of these ingredients doesn't vary from bread to bread. The amount of yeast you use may varies somewhat.

Proof your yeast

Yeast cells don't stay dormant forever, they slowly lose their potency. Under improperly-stored conditions the cells may die altogether. So whenever you start with a new batch of yeast from the store, proof it first to make sure it is alive.

Proofing is easy. Stir and dissolve the yeast in a small amount of warm water. (Don't add dry yeast all at once or it may clump into solid globs—sprinkle in slowly while stirring.) Add a generous pinch of sugar to provide food for the yeast. Many little bubbles rising to the surface after about 5 minutes prove that your yeast is as alive as you are. In 10 minutes the liquid should look as if it is just about to come to a slow boil—if not, the yeast is dead.

Once you know the batch of yeast you have is good, you don't need to proof it each time you bake—unless you only bake bread very rarely. Just dissolve the yeast in water and add them to your dough. Or add dry yeast directly to the flour. They come alive when you add the liquid to the dry ingredients, but the action is slower. Yet proofing the yeast is still a good idea each time you bake as it gives a jump-start to the dormant yeast cells, they start working a little faster after proofing.

Mix your dough

There are two ways to make bread dough:

- Straight dough method—mix the dry ingredients, add the warm water with dissolved yeast, and the dough is ready to be kneaded.
- Sponge method—mix half of the flour with all dry ingredients and yeast but omit salt. Add part of liquid ingredients to form a sticky, almost runny dough. Set this sponge, covered, in a warm place for several hours or overnight. The yeast feed on the sugar to produce a fermenting, bubbling mass. They multiply rapidly during this period of fermentation. When you are ready to bake, work the rest of the flour and salt into the sponge, knead and let rise. The sponge method replaces the first proofing of the dough so you may shape the bread after kneading. But an extra proofing time helps to create a better-flavored bread.

The sponge method, centuries old and used as standard in many commercial bakeries, produces the same dough as the straight dough method. The resulting bread, however, is moister and richer-tasting because acid-producing bacteria in the sponge have had a chance to add their by-products with their pleasing, slightly tart flavors. It does take longer than the straight dough method, so it is no longer suitable for large-scale bread production where time is money.

Choose whichever method you prefer and have time for. Recipes often specify one or the other, but there is no reason why you cannot change the recipe to suit your preference or time constraint.

TASTINGS How to slow down yeast

You can mix yeast dough ahead of time and keep it in the refrigerator for a few days, this is called retarding. The cold will dramatically slow the yeast activity. A few hours before you plan to bake the bread, remove the dough and bring it to room temperature. The yeast begins to work at a good clip within hours. How fast depends on the actual temperature of the room. On a cold winter day it could be eight hours. Expedite the process by placing the dough into a slightly-warmed oven. If it is a warm August day, the dough only needs 2 or 3 hours. Let it rise in the usual manner and bake.

You have three choices for mixing dough, provided you own a food processor and a mixer. If you don't own either, your only choice is by hand.

Kneading a stiff bread dough is about the most demanding job you can ask of a home appliance, or yourself for that matter. The machine needs to be quite powerful to be able to do the job without overheating or stalling. A small or even a medium-sized food processor or mixer won't do. However, kneading by hand is not difficult. It just takes a little longer and can relieve a lot of anger or frustration if you really get into roughing up the dough like you should.

Here are two of the most popular dough mixing methods when using your hands.

1. Add the dry ingredients to a bowl. Mix liquid ingredients in a container, including the

dissolved yeast, slightly beaten eggs and milk if the recipe calls for these. Slowly add the liquid ingredients to the bowl while stirring with a heavy spoon. As the dough starts forming, it gets harder and harder to stir. When it gets to this stage, dump the dough on a large cutting board or counter top, and switch to hand mixing. As soon as the dough is formed, start kneading. If it feels too sticky, sprinkle a little more flour on and work it in. If too stiff, sprinkle the dough with water and work it in.

2. The second method is faster and more professional, using a dough cutter, also called the bench scraper, a very useful kitchen tool. A dough cutter is square 4x6-inch (10 to 15 cm) steel with a handle on one long edge. The straight edge of the dough cutter is its blade, not sharp as a knife but thin enough to easily cut dough. It also makes cleanup work easy when you use it as an efficient scraper to clean the dough off your work surface.

To mix dough with a dough cutter, pile the dry ingredients in a small mound in the middle of your work surface. Your liquid ingredients are ready in a bowl. Reshape the flour mound to form a large well in the middle, and pour all liquid into this well. Using the blade of your dough cutter start mixing the flour into the liquid little by little, scraping small additions at a time into the liquid until well mixed, then adding some more. Keep an outside dike of dry ingredients around the liquid so none escapes from the well. By the time you get to the last ring of flour, the ingredients should form a dough. Now a few more turns by hand and the dough is ready for kneading.

A variation on this second method is to use your hands instead of the dough cutter to draw the flour into the liquid. It is also fast, but you end up with sticky, gooey fingers, a sure signal for the telephone to ring.

A good bread dough is neither sticky nor stiff but just comfortable to shape or manipulate. However, it is always better to be slightly on the too-moist side than too stiff. If your dough is too stiff, it resists the force of the enlarging bubbles and you don't get the fullest rising possible. A very stiff dough barely rises on proofing or in the oven. A slightly sticky dough rises much better, plus it also has plenty of extra moisture to turn into vapor in the oven, vapor that further helps to enlarge gas bubbles in the dough giving you a coarse, airy, light texture. But beware of too sticky dough or it spreads on the baking sheet before it solidifies.

Most bread recipes call for a fixed amount of liquid and instruct you to adjust the dough by adding more or less flour. However, starting with fixed amount of flour is a better approach, because you end up with a specific-sized bread. Start with the flour and add warm water gradually until the dough has the perfect consistency.

When you add sharp-edged ingredients to your dough, such as coarse cracked grains, it is a good idea to add them only after kneading and mix them in by hand. The sharp edges may damage the gluten strands and sheets, particularly with powerful machine kneading. Damaged gluten can limit the dough from rising to its fullest.

Kneading

Many bakers claim the second reason for bread baking is the sensuous feel and delight of manipulating the living dough by hand. It is relaxing, therapeutic and a thrill to work with responsive dough. It also gives your hands, wrists and entire arms a good workout. If you choose hand kneading, keep the board and your hands floured to prevent the dough from sticking, but avoid using any more than a dusting or your dough stiffens up. Choose a solid, firm and hard work surface, such as a sturdy table, butcher block or counter at waist level or lower.

Kneading by hand takes about 8 to 10 minutes, a little longer if you are gentle with the

dough or if you have a particularly stiff , resistant dough. In a proper kneading technique you use the heels of your hands with a powerful pushing motion directed down against the dough and away from you. With this pressing movement you develop the gluten sheets. Repeat this a number of times. Then press the dough down hard, pick it up, stretch it, fold it over, and repeat. Turn the dough from time to time so the entire mass gets worked. Pick it up and stretch it occasionally, then throw it down hard against your kneading surface. It soon develops into a smooth, elastic, rubbery stuff that gets easier and easier to work. Keep dusting the working surface with flour should the dough start sticking.

How do you tell a fully kneaded dough? Break off a small piece and stretch it until it is as thin as pizza crust. Hold it up against the light—the fine lines you see throughout are the gluten sheets you just developed. A fully kneaded dough feels firm and when you gently poke a dent into it with your finger, it slowly springs back. Bakers call this a *ready* or *fully-aged* dough.

If you use an electric mixer, follow the instructions of the mixer manual. You may have to mix and knead half the ingredient at a time if your mixer is small, then combine the two halves. The larger, more powerful home electric mixers can handle large enough dough for two large loaves at a time (that is 10 cups of white flour or 8 cups of part white, part whole wheat flour). Mixing should take 2 to 3 minutes once you learn the trick of adding liquid slowly and gradually. After the dough has formed, their recommended kneading time is 3 to 5 minutes.

TASTINGS Hint for food mixer kneading
A trick some bakers use for mixing bread dough ingredients, but manuals may not mention, is to use the flat beater first. This starts forming a dough within a minute. As soon as the machine starts complaining that the work is too hard, take the flat beater off, scrape it clean and switch to the dough hook. A little more cleanup to do but it is quick and efficient.

You can also use a food processor to mix dough. A larger powerful processor can take 5 cups of whole wheat flour or 8 cups of white flour. The second batch will bake into two medium loaves. Again, follow your processor's recommendation on how much to mix. Mixing takes just seconds in a food processor, kneading takes a minute or two.

In an kitchen experiment I baked three identical loaves but kneaded the dough by three different techniques: by hand, in a food processor and with a food mixer. The results were not very different and unless the three breads were side by side, you could not tell them apart either in flavor, texture or shape. Closer inspection revealed slight differences. The hand-kneaded bread loaf was somewhat smaller, with slightly smaller air holes, while the food processor loaf was the tallest and lightest, suggesting that this method develops the gluten structure the best. The difference is small enough, however, that I recommend you use whichever method you prefer.

Let the dough rise till double in size

The first rise, depending on the type of bread you are baking, takes one to several hours. The ideal temperature for rising is 80°F (27°C), but the dough will do fine anywhere between 75º and 85°F (24º and 30°C). If it is much cooler, it rises too slowly, and the texture of the bread will be coarse. Besides, it takes for ever before it doubles in size. If much warmer, the dough rises too fast, and thriving bacteria produce unpleasant-tasting sour by-products giving your bread off-flavors as well as making the texture uneven.

You have to find the right spot in your own living environment that maintains this ideal temperature. The inside of a gas range oven with a pilot light may be pretty close to this. The top of your water heater or refrigerator could be, too. Test various spots in your house with your thermometer. Once you find it, that can be your permanent bread dough proofing locale. If you have an electric range, play with it for a while to establish the right heat. Turn the oven on for 30 seconds, then turn it off. Measure the oven temperature. Keep doing this a few times (while letting the oven cool completely between trials) until you establish the time you need to bring your oven to about 80°F (27°C). Once you find the ideal preheat time, you can always use that to bring the oven to yeast-friendly temperature.

When I was a kid, my mother put the covered bowl of the early morning rising dough by my sister's feet in her bed who was a late-late riser. On a weekend, she could always count for warmth in my sister's bed at least until noon.

Most cookbooks tell you to coat the finished dough with oil or dust it with flour, put it in a bowl and let it rise in a warm, draft-free place. That is one way. To avoid cleaning up an extra bowl, use the one you just mixed the dough in. Cover it with a plate or foil. That eliminates the problem of draft in the house that interfere with the rising dough.

I use a plastic bag to minimize cleanup. I sprinkle the inside with flour, drop the dough in, and let it rise in the bag, allowing plenty of space to expand. When it is time to punch it down, just squeeze down the plastic bag and let the gas escape from the dough. Carbon dioxide gas is a noxious by-product for the yeast, that you need to get rid of. Too much gas interferes with their proliferation and punching the dough down releases the gas from the dough. When you are ready to shape the dough, turn the plastic bag inside out and dump the dough on a flour-dusted surface.

At this stage give the dough a gentle kneading of just a few turns to redistribute the yeast and their food, and to even out the dough temperature throughout. If you are only going to let the dough rise twice, this is the time to shape it.

If your recipe calls for three rises (not usually necessary but it produces a chewy, well-textured, yeast bread), let it rise once more. With the now much-multiplied yeast in the dough, it should double in size again in 30 to 40 minutes. You follow the last rise with one more quick knead then the dough is ready to be shaped and set for the final rise. Bakers call this *proofing*.

A hint about cleanup. The starch in the bread dough forms a quick-drying, stubborn mess in your bowl that is a pain to clean up. Don't fight it. Soak the bowl and dough-hook in water for several hours—the dough softens and you can scrape it off with ease with a rubber spatula.

> **TASTINGS Proofing bread in a *panier***
> The French has an elegant technique to proof a round loaf in a cloth-lined and flour-dusted basket. Once the bread is fully proofed, the baker gently inverts the dough on a baking sheet and removes the basket. The impression of the basket remains on the dough surface and embellishes the surface of the bread. It creates a show-piece of a bread that is irresistibly beautiful.

Be particularly careful at this final rising that the dough doesn't overdo it or the gluten structure may rupture and the dough simply collapses. If you suspect that you may have let the dough rise too long even though it retains its shape, gently press your finger in it. If the indentation shrinks, then slowly collapses, the dough has gone too far. You can still save it by kneading it a little longer to reform the gluten structure and let the yeast act on this fresh dough for another rise. By now the yeast has multiplied enough that it should not take long.

Professional bakers also use a slow-down technique for some yeast products, called *retarding.* They do this after they proofed and shaped the dough. To retard, they place it in a refrigerator designed for this purpose called a *retarder*. In the cold for several hours or overnight, the yeast fermentation slows down while bacterial fermentation starts (yeast hates cold but bacteria don't mind it). Lactobacilli from the air and flour produce lactic acid, other bacteria strains produce acetic acid—the process is similar to sourdough fermentation. As a result, during retardation slight pleasant sour flavor develops and texture changes. Bakers, for instance, retard bagel dough to develop the characteristic flavor and texture. Without this process bagel dough bakes into good ring-shaped bread rolls instead of bagels.

Can you over-knead a dough?

You cannot over-knead a dough by hand kneading, except if you are a passionate and powerful weight trainer. Your hands will tire before you break the sheets of gluten which have the strength of thin but strong rubber sheets. With a powerful machine you can indeed over-knead. Eventually the sheets of gluten will reach a stage where they don't have enough strength and elasticity to withstand the continuous punching of the dough hook, and all of a sudden they break into small bits of molecules. The result is a thick fluid mass instead of a smooth, elastic dough.

At this stage the dough is no longer capable of reforming a gluten structure to retain the carbon dioxide gas. This dough would bake into a heavy mass that resembles unleavened dough. If you over-kneaded your dough, start the process again with a new batch of flour. Feed the ruined raw dough to the cows. They never had a treat like that.

Shape it up

Ever wonder why bakers bake different-shaped breads? One reason is tradition. The shape of the loaf, the color and shine, slashes and patterns on the crust, even seeds sprinkled on not only vary the look, they also have an effect on the flavor.

Baking in a bread pan is somewhat old-fashioned, but it produces a square bread that is easy to slice into uniform pieces suitable for sandwiches. A free-standing loaf is baked on a flat baking sheet. It makes a prettier, crustier bread with less-uniform slices. This is ideal when you want a pretty presentation on the table.

A free-standing loaf may be the traditional long cigar or oval shape, or you can shape it into a round. You also have the choice of tapered and blunt ends. Even though different breads have certain traditional shapes, you can do whatever you wish when you are on your own. That is your own tradition.

Special narrow, trough-shaped baguette pans are perfect for French baguettes. Their design allows to make the largest crispy crust possible. Anything larger would be a bread stick. Baguettes are particularly delicious because of their crisp, thick crust, and you want as much of that crust as possible. As soon as the baguettes start to brown and firm up, about two-thirds of the way through the baking time, you can remove them from their pans and place them directly on the oven shelf or a pizza stone for the rest of the baking for more crisp crust.

Shaping a loaf is simple if your dough is soft and pliable. If the dough is stubborn and simply won't cooperate in your shaping effort after the last kneading, be patient. The gluten structure needs time to relax, just like the cook does. Cover the dough with a moist towel so its surface won't dry out and let it sit for 10 or 15 minutes, just long enough to prepare and sip a fresh-

brewed cappuccino. Then try shaping it again.

For a pan loaf, flatten the dough into a rectangle, fold into thirds like a letter and roll it up tight into a long loaf. Place it seam-down in your lightly greased loaf pan. For free-form shapes baked on a sheet your procedure is similar but you elongate the ends slightly.

Bake at an even temperature

Bake at an even temperature seems like a strange instruction, given today's thermostat-regulated ovens, but some of our great-grandmothers went through much struggles with their weekly bread baking to maintain an even temperature on their wood-burning cook stoves.

In Europe, before the large commercial bakeries, every little community had its own small bakery or two. In towns there were many. Housewives still preferred to mix their own bread dough in large wooden bowls, kneaded it, let it rise a couple of times, shaped the dough into several loaves, set on baking sheets, then took them to the nearest bakery with their names stuck on the dough on a slip of paper. The baker's oven was much more reliable than their own. The owners returned for their fresh-baked, hot breads a few hours later, picked them out from the rows and rows of similar but sumptuous, still-warm loaves on the shelf, each one with a slip of paper and a name scribbled on. They wrapped their loaves them in several layers of towels, paid the baker for his services, and home they went with their breads that had to last for a week. The best part, the freshly baked mainly-crust heels, still warm from the oven, were divided meticulously among any family members who happened to be home when the breads arrived.

The baker baked all the different types of breads in one single huge brick-lined bakery oven. Knowing which bread required what temperature, he placed the loaves higher or lower on the oven shelves. Some households brought in pots of beans with their bread loaves, which the baker placed in the cooler regions of the oven to slowly bake for half a day.

The baking temperature, though not critical, is important enough that you should make sure your oven thermostat is accurate by checking it with a good oven thermometer. If the oven temperature is too low during the oven spring stage, the increased activity of the yeast occurs before the gluten protein structure has a chance to solidify. The dough may collapse once the gases escape through the semisolid gluten. If the oven is too hot, a thick crust forms too soon and prevents the bread from rising properly.

All crusty breads bake with injected steam in the commercial bakeries' ovens that contribute to a heavy, crisp crust . Obviously, as a home-baker you are not equipped with steam-injecting ovens but you can create steam to emulate commercial ovens. Without steam the air in the oven is like a dry sauna, crust forms quickly but it is a thin crust. However, it is thick enough to prevent the dough to fully expand. With steam the air is like in a wet sauna, the surface of the dough remains fairly soft and let the dough expand to its fullest. Only during the first 10 minutes of baking does the dough need a steamy oven. A thick, chewy bread crust forms later in dry heat.

To pretend you have a steam injection, pour a couple of cups of boiling water into a small baking pan and place it on the bottom shelf or floor of the oven as soon as you turn it on to preheat. Leave the pan in during the first 10 minutes of baking. For additional moisture spray the bread dough with a spray bottle just before putting it in the oven and a couple of times during the first 10 minutes. Close the door quickly to hold the steam in.

Some professional bakers suggest a second method. Keep an old, heavy baking pan on the bottom of the oven while preheating. Just before ready to bake the bread, pour a cup of water into the hot pan, put your bread dough in fast and close the oven door. During this operation the oven

temperature can drop. To remedy this situation, some bakers heat the oven 50º hotter than baking temperature and reduce the heat as soon as they close the oven door.

For even heat use a pizza stone or line the bottom rack with unglazed tiles

Bake the dough for the amount of time specified in your recipe. But it is a good idea to test the bread a little sooner. The baking is complete if the bread gives off a hollow sound when tapped on the bottom and the crust turns a gorgeous caramel brown. The hollow sound means that there is no longer any moist dough in the center. When baking in a pan, the test is the same—turn out the loaf and tap it on the bottom.

You can use a thermometer, should you prefer the scientific approach. The thermometer should read 190º to 200°F (75º to 80°C) when the bread is done.

Focaccia

The Italian *focaccia*, that became so trendy in America in the 1990s, is an easy baking project for even beginner yeast bakers. Fresh *focaccia* is very satisfying, and once it becomes a day or two old, you either refresh it in the oven or you may eat it slightly dried with a crispy, crunchy, cracker-like quality. You may dress up *focaccia* with toppings that ranges from a light sprinkling of herbs or spices to a thick layer of vegetables—often spicy tomato—almost like a pizza. In fact, *focaccia* dough is a close cousin to pizza dough.

Ingredients

1 cup water
1½ tablespoons dry yeast
½ teaspoon sugar
4 cups bread flour
1½ teaspoons salt
2 tablespoons olive oil
¼ cup fresh rosemary or 6 tablespoons fresh sage, chopped

Procedure

1. Sprinkle yeast and sugar in water while stirring. Let yeast proof for 5 minutes.

2. Combine flour, salt, olive oil and herbs. Gradually add yeast in water and keep adding more water until the dough handles easily. Knead with hands or machine until soft and elastic, about 10 minutes by hand, 4 minutes in mixer, 1½ minutes in food processor. Let dough rise in a flour-dusted plastic bag or covered bowl in a warm place until double, 45 to 60 minutes. Punch it down and let it rise again until double, about 30 minutes.

3. Punch down dough, knead it another minute, cover with damp towel and let it rest 10 minutes. Oil a baking sheet about 14x11 inches (35x28 cm) in size generously with olive oil. (Smaller baking sheet make thicker *focaccia*). Place well-rested dough on sheet and spread it out by pressing thickest parts with floured fingers. When dough covers three-quarters of the sheet, cover and let rest for 10 minutes.

4. Continue spreading dough until it covers the entire baking sheet. Dimple surface all over with fingers, drizzle generously with olive oil, then lightly with coarse salt. Let dough rise covered until double, about 20 to 30 minutes. Meanwhile, preheat oven to 425°F (220°C) with 2 cups of boiling water in a pan on the bottom shelf.

5. Bake *focaccia* in preheated oven for 20 minutes, or until surface is crisp and brown. Cut into about 40 to 45 squares and serve fresh. Store extra in freezer.

Once baked, let the bread cool on a wire rack before slicing. This allows excess steam to escape so the crust remains crisp, and it also completes the chemical changes of baking. Remain calm and hold off for at least 10 minutes before the first bite, even though there is nothing like eating freshly-baked bread hot out of the oven. If you have tried it, you know how easy it is to get a stomach ache from eating the hot bread. One reason is that hot bread tastes heavenly and you tend to overeat. But there's also another reason—hot bread is hard to digest because the various chemical changes are not complete until the bread cools.

Glazing and seeds

Most breads develop a nice brown crust in a hot oven even without a glaze. But a glaze can dress up the crust to shine with tantalizing beauty and eye appeal as the rows of master bakers' breads do in a good bread bakery.

If you like a soft brown crust, brush the dough with milk before baking. The lactose (milk sugar) in the milk caramelizes during baking giving you color but not crispness. You can also brush nearly-finished hot bread with cream or butter and return it to the oven for the last few minutes of baking. Another way for soft crust is to brush the loaf with melted butter right after removing it from the oven and cover it with a damp cloth. For a crisp brown crust, brush the dough with melted butter before baking.

For an alluring shiny crust, brush the hot bread with egg wash or, for sweet breads, sugar syrup near the end of the baking period, then return the loaf to the oven to finish baking. Or brush the top with a cornstarch solution (see sidebar) before you put the loaf in the oven to bake and once again after the loaf is baked but still hot. Brushing with oil right after baking also shines up the crust.

TASTINGS Cornstarch glaze for breads

To make a cornstarch solution, dissolve 1 teaspoon cornstarch in 2 teaspoons cold water. Mix this into 3 tablespoons of boiling water in a tiny pan and stir for a few seconds until it thickens. Keep the extra in a covered labeled container in your refrigerator for the next batch of bread. The solution keeps for at least 6 months.

For a country-style crust, like that of traditional Italian and peasant breads, dust the top and sides of the dough generously with flour before baking.

Seeds not only give grace and elegance to breads but enrich them with flavor. Sesame and poppy seeds are old traditions but today's imaginative bakers enlarged their seeding repertoire beyond those. Any seed goes. If you feel like having seeds on your bread, sprinkle them right after glazing or after you sprayed the surface with water so the seeds stick better. For bread rolls and bagels, press the moist top of each roll or bagel into a plateful of seeds before the last rise, then set them right side up on the baking sheet. In fact, you can do the same with full-size loaf if you like plenty of seeds on the crust.

Slashing

Slashing is mainly for appearance, but it changes the texture and even the quality of the bread slightly. When bread goes through a final quick rise in the oven (the oven spring), the rising dough will extrude along the slashes forming ridges or lips along each slash. These thicken while baking, giving even more crust. Bread bakers call these *blooms*. They make the finished loaf professional-looking and give an outline of rugged, irregular, appetizing shape to each slice.

To slash the dough you need a very sharp, thin-bladed knife or a blade. The knife must be sharp so it does not drag the dough but make single, well-defined surgical cuts. The cuts should be at least an inches deep. Always slash after glazing and just before you put the dough in the oven.

On a standard French bread, tradition calls for 4 or 5 cuts, each one oriented nearly parallel to the long axis of the bread and off-set by a couple of fingers' widths from each other. For an oval-shaped Italian or Vienna bread, make 2 parallel cuts along the loaf that divide the bread into thirds. These are shallow slashes sloping *outward*, not inward. Round breads have a distinctive slash pattern. The slashes are vertical and at right angles, giving you a checkerboard effect with either small or large squares.

Braiding

For a truly elegant and exquisite presentation, deck out your bread with braiding. Traditionally, braided breads are the richer egg breads and Jewish challah breads. You cannot easily braid heavier breads, such as whole wheat, rye and sourdough or any bread from stiff dough like French bread—the dough has well-developed gluten that resists all your braiding effort. Light dough, particularly those that include lubricating oil, butter or egg are easy to manipulate. You can braid 3, 4, 5 or 6 ropes. Braiding is just a little extra work and it is worth the effort for a festive look.

Here is the way to braid. First divide your dough with a knife or dough cutter into as many pieces as the number of ropes you want to make. Let the gluten relax in the covered dough for 10 minutes for easier handling. With your hands, roll each piece into a long rope, just a bit longer than the length of the bread you intend to make. Lay them out parallel next to each other on a lightly flour-dusted surface and start braiding by first pinching one ends of the ropes together. Proceed with a braiding pattern (see sidebar) until you finish the full lengths of the ropes. Pinch the finished ends together and tuck slightly under the loaf.

TASTINGS Braiding patterns

Here are the patterns for braids, the ropes numbered from left to right:

3-rope	**4-rope**	**5-rope**	**6-rope**
1 over 2	1 over 4	2 over 3	2 over 6
3 over 2	3 over 1	5 over 2	1 over 3
1 over 2	4 over 3	1 over 3	5 over 1
3 over 2	2 over 4	2 over 3	6 over 4
1 over 2	1 over 2	5 over 2	2 over 6

An interesting braiding variation is the double three-rope braid. It sounds complicated, but it is really not. To make the double 3-rope braid, also called top challah in Jewish bakeries, you first divide the dough into two unequal parts, three-quarters and one-quarter. Make the usual 3-rope braids from each, then stick the small braid on top of the slightly moistened large braid, building a

two-story loaf. This is a simply fabulous-looking bread!

Variations on a theme

Once you feel at ease with yeast dough, other yeast products are a snap. Pizza dough, Italian *focaccia*, pretzels, English muffins, bagels and *calzone* are not that hard to produce. There is no limit to the amount of fun you can have with yeast. (You can even keep them as pets.) The baked goods are almost always edible even if you make an error here and there in preparation. As long as you follow the few basic rules, the yeast is alive and happy, and the gluten structure is solid, you will end up with something not only edible, but delectable.

You need a challenge with a yeast preparations? Try croissants. Making them requires the skill of a pastry chef and a bread baker. Home-made croissants, though challenge to make, are absolutely heavenly when fresh from the oven and they are an enormous satisfaction to your baking ego. With a good tart jam or marmalade, they provide a breakfast for the most festive occasions. You make croissant dough the same way as puff pastry dough but yeast is the leavening agent in croissants and the proportion of ingredients are different. There is only half as much butter in croissant dough. See the Dessert chapter on how to make puff pastry. Once you learn puff pastry, you are also an expert on croissants.

Storing Breads

Like fresh-ground coffee, all breads—whether leavened with yeast or baking powder—start their downhill journey into staledom soon after they leave the oven. If they are still on the shelf in a commercial bakery after 8 hours, their new home will be in plastic bags to slow down staling, and by the next morning they are up for sale at half price as day-old breads or are given away for a homeless shelter.

Baking at home you are in control to take advantage of serving absolutely fresh breads, as well as to slow staling. When the meal is over, don't let the bread sit in the basket for another half hour but wrap it in a heavy plastic bag. That cuts off the harmful oxygen and seals in moisture to slow staling. Since we now know all about staling (see section above on Staling), we know that we have two storing choices to minimize it—keep it at room temperature (that slows it down) or freeze it (that nearly stops it). If you decide to freeze the bread, use a heavy plastic bag, squeezing out as much air as possible before sealing. Double bagging in two plastic bags is even better. Thin plastic bags are not moisture tight and eventually your bread dries out in them. If that is all you have, use at least three bags.

Many bakers slice the bread before freezing to make it convenient to defrost a few slices at a time. Defrosted slices taste almost as fresh as when first out of the oven. Or freeze the loaf unsliced if you expect to use a full loaf next time.

Quick breads, muffins and their various cousins are just heavenly fresh out of the oven but they stale fast. Commercial bakeries often add chemicals to retard staling, along with extra oil, that also helps maintain freshness. Anything you have read about how to slow staling of yeast breads also applies for quick breads. If you don't plan to eat the bread or muffins the same day, wrap and freeze as soon as they cool, particularly if the oil or butter content is low. You can successfully refresh them in a warm oven (see Staling above).

You can reheat all baking powder-leavened goodies freestanding on baking sheets. This gives them a slightly crunchy crust. If you prefer the original soft crust, put them back in the

containers you baked them in—muffins in muffin pans, breads in bread pans.

TASTINGS Can you freeze dough?

You can freeze dough at any stage—either right after kneading, or after the first, or even the second rise. When you want fresh bread, defrost the dough slowly in the refrigerator. This takes half a day to a day depending on the size (you may think of dividing the dough into two or three before freezing for quicker defrosting). Don't even think of using your microwave. The yeast cells get nauseated under radiation therapy and heat may be too concentrated in parts of the loaf. Then let the dough warm up for a few more hours in a warm place. Shape your loaf, let it rise one more time and bake as usual. Using this method, you can prepare several dough at one time and freeze all but one for later use, if you have the freezer space. It guarantees each loaf to be as fresh as possible. Be aware though that after freezing yeast activity may slow, particularly if the dough had been in the freezer for several months. You need a little longer rising time than with freshly-made dough, or, even better, mix into the dough a small amount of freshly-mixed yeast you prepare as a sponge.

Bread Machines

That ingenious invention, the bread machine came on the market in the late 1980s. (Originally they called it bread making machine.) It makes bread with almost no effort on your part, systematically going through all the steps of yeast bread baking with the electronic computer brain of a robotic baker.

The way it works is amazing, though seemingly simple. You add the ingredients into a bowl in the innards of the machine and turn it on. The machine mixes them with a powerful dough-mixing blade, then kneads the dough thoroughly, lets it rest and kneads it again. A control heats the machine so the temperature is correct for proofing.

After the first rise, it kneads the dough again for just a few seconds, then lets it rise a second time. The computer brain tells the machine to heat to baking temperature, and bakes the dough in the same bowl, followed by a cooling-down stage. Then the computer turns on a fan to get rid of the built-up moisture and keep the crust crispy. The entire process takes between 3 and 4 hours.

The major advantage of the machine is the ease with which you arrive at a home-baked bread with so little effort. You can even buy a bread machine mix containing flour, salt and yeast in the correct proportions. All you have to do is add water. It ups the cost of each loaf substantially, of course, because somebody else had to do your work of measuring out ingredients and then to package the mixture.

The disadvantages of a bread machine are numerous enough to think twice before you invest in this fairly costly appliance. First of all, the bread is not memorable. You are probably better off to buy a loaf of good bread at a bakery (if you have one nearby) and refresh it in your oven to get the fresh-baked flavor and smell. The crust on the bread I made with this appliance was too soft, even when I selected the French bread cycle on the machine.

Some models produce very awkward shapes. The one I tried came out in a squat cylinder about 6 inches (15 cm) in diameter and not much taller. The soft, funny-shaped bread was clumsy to slice even after I cut the cylinder in half lengthwise. Other models produce rectangular, square or round loaves, but none of them can make anything resembling a freeform bread or even a French

baguette.

The end result is a fairly good, chewy, light bread that some people like (particularly the owners of the machines). Machine bread compares favorably with many store-bought breads, depending where you live and how available good fresh bread is. Glazing or slashing are not possible. Underbaking and overbaking, doughiness, or moist patches in the loaves may be a problem, as well as uneven browning of the crust. (Bread machine owners can tell you many more problems.)

Bread machines only produces acceptable white or whole wheat loaves. If you modify the recipe with added ingredients or substitutions, complications arise and you have to start tinkering with the process and keep an eye on the machine. It partially defeats the time-saving reason for using it in the first place.

The biggest disadvantage (besides its cost), however, is probably the size of these machines. They are bulky and heavy, not easy to store in a modern kitchen that is already crowded with microwave ovens, mixers, food processors, blenders and myriad of other space-demanding kitchen items.

Points to Remember

- Breads may be unleavened, (matzo and tortilla), or leavened (yeast breads). Leavening is the process of adding air-holes into the dough to make it light and airy.
- We use two types of bread leavening agents—baking powder for quick breads (e.g. zucchini bread) and yeast for our common breads.
- Today's baking powder is double-acting. One set of chemicals start forming bubbles when you introduce moisture, a second set when you heat the batter in the oven.
- Two points you need to remember about yeast dough:
  1. Keep yeast happy by providing them favorable environment
  2. Develop gluten fully in your the dough.
- Ideal temperature for dry yeast to revive is in very warm water, 105 to 110°F (41 to 44°C). But they thrive at a cooler temperature of around 80°F (27°C) to produce bubbles in the dough during its rise.
- Baking yeast need food to start and do their work. They love sugar the best but they can also live on starch in flour. They don't like too much salt or spices or too acid environment.
- Gluten develops from two proteins in contact with water that all wheat flour contains. Only kneading develops gluten fully. Other flours contain little or none of the gluten-forming proteins and don't produce light breads, unless you mix in at least some white wheat flour with the dough.
- High-protein, low-starch flour (bread flour) makes the best yeast breads. All-purpose flour is a good choice for quick breads.
- Yeast bread dough needs to rise once or twice before shaping to develop light texture and good flavor. Quick bread dough doesn't need to rise.
- Don't let the bread dough over-rise just before baking, or the fast rise in the oven (*oven spring*) may rupture the dough.
- Control the staling of your bread. Bread stales fast at refrigerator temperature, much slower at room temperature, nearly stops in freezer. Staling is reversible—heat the bread with

moisture to at least 140°F (60°C) to refresh it.

- You can refrigerate or freeze yeast dough at any stage to delay baking.
- Glazing the surface, sprinkling with seeds and slashing before baking improves the appearance and flavor of yeast breads. For festive occasions braid the bread dough.
- Bread machines don't produce great breads. If you want the best, use traditional bread baking methods.

I hate television. I hate it as much as peanuts.
But I cannot stop eating peanuts
Orson Wells

NUTS TO YOU

You wouldn't know it from the way they are used in the kitchen, but nuts, seeds and eggs have a lot in common. All three contain the basic chemical elements to start new lives, therefore all are nearly complete foods, high in protein.

We use eggs often in all sorts of dishes from salads (mayonnaise) through main dishes to desserts, but we restrict nuts and seeds primarily in desserts and snack foods. In fact, they have a major role in the snack food industry, either by themselves or in sweet preparations like candy bars. Central and Western European pastry kitchens are particularly fond of nuts. Tortes, which are a specialty of that part of the world, actually substitute ground nuts for flour, adding a wealth of both flavors and calories.

What are Nuts and Seeds

Are nuts different than seeds? Botanists say no. In fact, they view some of our most popular nuts, like almonds and walnuts, as one-seeded fruits surrounded by a tough, dry layer, the husk, rather than juicy flesh, like peaches have. It is happens, that these particular fruits we cultivate for their pits. Other nuts, like Brazil nuts, coconuts and pine nuts, are truly seeds. Some obvious seeds, like the sunflower seeds, amazingly to us, are fruits to the botanist. To confuse things even more, our beloved peanut is not a nut but a legume, closely related to peas. (Don't let the kids find this out or they'll be demanding peanuts as their green vegetable of choice.)

Different nuts grow on different parts of trees. Hazelnuts grow on shrubs instead of trees and most seeds are a part of small annual plants. Since most common nuts grow on trees, growers lump all nuts together and simply call them tree nuts.

This is all nice and fascinating, however, our own interest is what they do in the kitchen, irrespective of where they grow. Fortunately, all nuts and seeds behave similarly in the oven and in our cooking pots. Their fundamental nutrition is the same, too, high in oil and protein with little carbohydrate and moisture.

The native American acorns

We have four common, edible native North American nuts—pecans, hazelnuts, black walnuts and acorn. *Piñion* nut is also native, but only common locally in the Southwest. And chestnut is American, too, but a disease wiped out nearly all American chestnut trees. Our native Indians used all four nuts, as well as *piñion* nuts and chestnuts extensively.

Acorns grow on oak trees, and in northern California Indian tribes employed intensive horticulture to increase the acorn crop from natural oak trees, particularly the acorn of black oaks. This was by no means similar to today’s agriculture—they didn’t plant oak trees and cultivate them. They combined the natural growth with clever techniques to promote higher yields. In fact, without their aid, acorn yields would have been negligible, not a food source. In nature pests destroy as much as 95 percent of the acorn crop. They used systematic, low-level fires, that kept pests in control but also discouraged competing trees and undergrowth. They altered the heavy underbrush terrain into park-like forests. Oak trees are resistant to fire so the net result was more and healthier oak trees. Without underbrush harvesting was efficient and easy.

Acorn is unusual when compared to our common nuts because it is much lower in oils and proteins and higher in starch. It has a high tannin content that makes it so astringent that it is inedible without treatment. Indians buried the acorn for a long enough time for the groundwater to leach out the tannin. For more immediate use they dried the acorn, ground it to a fine powder, cooked and rinsed it many times in water until they leached out all the tannin.

For some reasons we no do not use our native acorns at all.

Nut Nutrition

Nuts are very high in protein but they are also high in oil. (Oil is same as fat but in nuts it is in liquid form as nut-oil). Protein content averages about 20 percent, same as most of our meats (about 11 grams in a 2-ounce or 36-g serving). Four of our nuts—chestnuts, coconuts, macadamia nuts and pecans—are lower in protein. Few people realize that a total of 50 to 70 percent of the nut meat is oil (28 to 40 grams in a 2-ounce or 36-g serving). When eating nuts you consume the same amount, or more, oil as if you were eating raw bacon (55 percent fat). All that oil can be a real detriment for people on low-fat diets, unless they are able to eat just a tiny handful at a time (which is nearly impossible from freshly roasted nuts). Sprinkling a few on cereal, salad, or even frozen yogurt, won't set off any alarm bells, but emptying a bowl of cashews during a football game in front of the TV can shoot your fat allotment for a week (and salt for a month). It is a blessing, though, that most of the oil is not the saturated kind that raises blood cholesterol level. The average saturated fat (of the total fat) in most nuts and seeds is only 10 to 15 percent, except in coconut with 76 percent.

Even though high in nutrition thanks to their protein content, their high total oil downgrades nuts and seeds on dietitians' scale. Though low in saturated oil, they are still high in calories. We eat nuts and seeds for their flavor, more than for their nutrition. But help is coming. Food scientists are researching the possibility of lower-oil nuts with some success. The U.S. Department of Agriculture in the late 1980s developed a technique that removes half of the oil from a peanut. They gently press fresh nuts to remove the oil without damaging the kernel. A bath in hot water helps return the squashed nuts to their original shape. These lower-oil peanuts retain most of their flavor, and, after roasting, they are even crunchier than unprocessed nuts. Something, however, didn't go right because they never came on the market.

From Nut Tree to Table

All the most commonly available nuts have excellent flavor, yet some have high prices and are considered luxury or gourmet items, like macadamias and cashews. The nuts considered ordinary and run-of-the-mill, like peanuts, are bargain-priced in comparison. The major reason for price variation is ease and low cost of growing and harvesting, not the quality of the nut.

Successfully domesticated nuts, like walnuts, give high yield and are easy to harvest. High yield means 100 to 200 pounds (45 to 90 kg) (unshelled) for every tree (for a chestnut tree, even 300 pounds or 140 kg). They lose very little of this crop to insects, and harvesting is mechanized. A machine grabs the tree, shakes the devil out of it and harvesters collect the fallen nuts with simple end-loaders from the smooth, stone and weed-free, park-like ground surrounding the tree. Some nut trees have much lower yield but growers can plant them closer together, so they still produce a high yield for the amount of land they take up. Almond trees, for example, are small compared to walnut trees, and the yield from each almond tree is only about 8

to 9 pounds (3½ to 4 kg) of nut meat (about twice the weight in the shell), but the rancher can plant 120 trees in every acre. A 100-acre orchard produces 100,000 pounds (45,000 kg) of shelled almond meat in a modest harvest year, maybe twice as much in a good year.

When freshly harvested, all nut kernels have high moisture, between 35 and 50 percent, of the nut meat. The tough, airtight shell protects them from animals, insects and bacteria, and slows deterioration. But as soon as they crack the shell, the kernels are very susceptible to microorganisms. A particularly dangerous mold produces a carcinogenic material called *aflatoxin* in the kernel. Before they are processed, inspectors screen nuts and seeds for the presence of aflatoxin. If they find more than trace, they cannot use the nuts for human consumption. They can still press and use the oil from them because aflatoxin is not soluble in oil and remains with the rest of the meat.

The only practical way to eliminate microorganisms in nuts is to quickly reduce their moisture to a level too low for organisms to grow. In practice it is reduced to 4 percent within 8 to 10 hours after shelling.

Since heat improves the flavor a great deal, in food processing in the first step nearly all nuts go through roasting.

Our Common Nuts

There are a dozen nuts and four seeds that we commonly use. Here's information about each of them.

Almonds, the world's most popular nuts, are native to central Asia or western India. An almond has three parts—the outer husk, the nut shell and the edible kernel inside. Almond trees now grow in any part of the world that has a favorable warm climate. California, which is the only place in North America with commercial almonds, produces 65 percent of the world's total. Spain grows most of the rest.

Although there are a number of different varieties in cultivation, agronomists favor a few for their good flavor, thin shell that is easy to crack without damaging the kernel, ease of cultivation and harvest, good yield, and resistance to insects, bird damage and frost. Older cookbooks mention two types of almonds, bitter and sweet, but the two are really the same. A single dominant gene in the plant determines which flavor wins, and in the varieties we grow today, they eliminated the bitter gene. Eating the kernel of a peach pit gives you an idea of what bitter almonds taste like.

TASTINGS Obsolete poison

Some bitter almonds are still in demand for their essential oil (the part of oil that contains the flavor compounds), used in food flavoring and for scents. The oil contains a high amount of cyanide, and it is this oil of bitter almond that used to be popular for both suicide and homicide. The oil is no longer in fashion for such purposes, probably because guns are easier to get.

Walnut is our second most popular nut. It originated in Iran (Persia) and was originally called Persian walnut, but the more common name today is English walnut. Of the 15 species of edible walnuts, two are in commercially orchards—the English walnuts and the native eastern North American black walnuts. California is the major English walnut producer in the North America and the U.S. is the major world producer, with France and Italy next. Walnuts are

favorite in western cuisines. They are particularly favored in England (that is where the name English walnut comes from), where they even pickle them and serve in their pubs along with stout or ale.

Black walnuts have a hard shell that is difficult to crack and have small kernels that don't readily separate from the shell, so they are not much sold in the stores in the shell, except locally. Food processors use them mostly for flavoring ice creams and some other sweet food items.

Peanuts, as I mentioned before, are not nuts at all but close cousins to the pea. They came originally from Brazil and, luckily for us, are easy to cultivate. Botanically they are odd little plants. The peanut seeds grow into a small bush 12 to 18 inches (30 to 45 cm) in height with delicate yellow flowers. After flowering they develop a strange structure called "pegs" that drop on the ground, become incorporated in the soil and mature into peanuts in four months.

It is a major commercial crop in the southeastern U.S. and there are few Americans who don't like peanuts, though many unfortunate people are allergic to it.

Known as ground nuts in some countries, most of the world grow peanuts, but India and China together grow half of the world's supply. U.S. production is substantial, but we only contribute 10 percent to total world production.

The U.S. and Canada are the only countries where people eat peanuts whole, crushed, and ground into peanut butter. Elsewhere the bulk of the crop goes into peanut oil. About half of American peanuts end up as peanut butter and 25 to 30 percent as roasted nuts.

TASTINGS The truly American peanut butter

Only three countries produce peanut butter, the U.S., Canada and Holland, with the U.S. the only country that both grows and grinds them into peanut butter. To be called peanut butter, at least 90 percent must be peanuts. The rest is sweetener, salt for flavor and hydrogenated vegetable oil to prevent the oil from separating out.

The U.S. grows three different varieties of peanuts, each for a different purpose. Virginia peanuts, that are best roasted in the shell for snacks, runner peanuts, having a particularly sweet flavor, are great for peanut butter and the third variety, Spanish peanuts, for candies and canned snacks. They also use Spanish peanuts for peanut oil.

Pecan is a true Native American nut, a close relative of the hickory nut. Native Americans used wild pecans for thousands of years as a staple food. Eastern, southeastern U.S. and northern Mexico are the prime pecan orchard areas. Currently cultivated varieties are superior to the wild ones because they have larger kernels and thinner shells. There are over 300 kinds of pecan trees, but the ones favored by growers have the thinnest shell for ease of cracking without damage to the kernel.

Pistachio is a warm climate nut originally from Iran, Afghanistan, adjacent Turkestan and parts of India. These nuts grow on a small tree that thrives in the warm Mediterranean climate, the southwestern U.S. and California. Today the U.S., Iran and Turkey supply the whole world with pistachios.

A gummy husk surrounds the pistachio nut that soaking helps to remove. As they mature, the shell opens naturally. Because the shell is partly opened, it is easy to remove the kernel, so you find most pistachio in the shell. Pistachios are a great snack. People on a diet can eat more, using the rationale that it takes energy to pry the shells open and extract the nuts, energy that needs to be replenished by eating more nuts.

In the 1930s when pistachios first became a fashionable snack food in the U.S., they dyed imported nuts red to hide the surface stains on the shell that resulted from poor harvesting practices. Red pistachios are no longer common, but avoid them if you find them for sale. We don't need any more red food dye in our bodies, and when cracking the shell by hand, you are apt to consume some of the dye along with the nut meat.

Pine nuts or *piñion* nuts are also native to North America. They have a close Mediterranean relative called *pignolias*. The two look similar but have a different taste and nutritional content. Pine nuts have excellent flavor with a hint of resin (after all, they grow on a resinous pine tree). Pine nuts are not cultivated and harvesting in the wild is costly, so their price is always high. The New Mexican *piñion* pine tree variety grows only above 7000 feet (2100 m), and bumper crops occur only every seven years. Anyone can collect up to 25 pounds (11.4 kg) in the National Forests of the Southwest, but you need a free permit.

Piñion nuts were an important source of high-protein, high-fat food for the Piute Indians, natives of the southwestern U.S., who used them in soups and in ground-up form in a mush-like preparation.

Macadamia nuts grow on an evergreen tree from the rain forests of subtropical southeast Queensland and northeast New South Wales of Australia. Like everyone else, they fell in love with Hawaii once they reached the islands in 1882. They thrived on the volcanic soils, and the climate was also perfect for them. Hawaii has become a major producer, growing 70 percent of the world's macadamias.

The nuts are subtle-flavored, crunchy-textured, cream-colored luxury nuts with matching luxury prices because the demand far exceeds the supply. They have a very hard shell that few consumers would enjoy fighting, so in retail you always find them shelled, either raw or roasted. Roasting further accents the heavenly flavor. We enjoy macadamias almost entirely as snacks, either by themselves or incorporated into candy bars. Trendy American chefs in the 1990s have taken them up as an "in" ingredient in various concoctions, justifying the exorbitant menu prices.

Two of the three macadamia species are edible, but growers only cultivate one. The second edible species grows a nut with too high a sugar content that caramelizes excessively when roasted, giving the nut a bitter taste.

TASTINGS How macadamia got its name?

> The name *macadamia* came from an Australian, John MacAdam, but his connection to these nuts is a little hazy. One source says he introduced the nut himself in the 1850s, but another insists that a botanist named the tree after his friend John MacAdam. Whatever the truth is, the name *macadamia* has an exotic, elegant, even romantic connotation.

Hazelnuts and **filberts** are closely related and you can use them interchangeably in your kitchen. Filberts are larger and grow on small trees in the Mediterranean and Western Europe, including England. The name comes from St. Philibert Day, August 22, when the nuts are ready for harvest in southern England. Hazelnuts are native to North America but are not nearly as popular, as filberts are in Germany, England, France and Central Europe, where they are cooks' top favorites. Turkey grows most of the world's filberts.

The American hazelnut tree is related to the birch. It is actually a small shrub which grows in the Northeast and upper Midwest, but the most extensive hazelnut orchards are in the Northwest in Oregon. Freshly roasted hazelnuts are worth dying for—few flavors can match

them when fresh out of the oven.

Brazil nuts are few and far between. We see them in the nut bins at the supermarket during the holiday season, usually mixed with other unshelled nuts for your guests to crack with that ornate nutcracker Aunt Mabel sent you as a wedding gift. You may find one or two token Brazil nuts in the canned nut mixes, whose population is mostly low-class peanuts. Brazil nuts are high-priced, so food packers count them out frugally.

Brazils are the only common nuts that stubbornly refuse cultivation. They are native to the Amazonian rain forests and grow on enormous trees in a fascinating fashion. A coconut-like hard shell holds 12 to 20 nuts, arranged like orange segments. When the nuts are mature, the entire thing falls to the ground where workers collect them by hand only early mornings. Why in the morning? Supposedly that is the least likely time they fall high up from the tree. Each shell weighs between 2 and 4 pounds (1 to 2 kg) and can easily kill a gatherer if they make a direct hit on top of the head. These nuts are expensive even with cheap labor because of hand harvesting.

Cashews still warm from toasting, have as incomparable a flavor as the best of nuts. Fresh cashew nuts are excellent, but fresh ones are hard to find away from the growing areas. The few cashews you find in a mixed nut can are anything but fresh.

Cashew trees are native to Central America, Mexico, South America and the West Indies and they have also been successfully introduced into Asia and Africa. There are many varieties, but none has been really tamed into providing us a fast-growing, uniform and consistent crop. Harvesting is extremely labor intensive, even though each tree yields 200 pound (90 kg) of nuts a year. The nut forms at the end of a highly-perishable fruit called the cashew apple. Originally they harvested the cashew apple, which some people say is better tasting than the nut itself, and they discarded the nut because of its very hard shell. Unfortunately, cashew apple is so perishable that it cannot survive transportation outside the cashew harvest area—few of us had the chance to taste it.

A thick, husk-like layer, called the *cardol,* surrounds the nut itself and a very tough shell protects the kernel. That tough shell is only one of the major problems of harvesting. The other problem is a caustic oil contained in the *cardol* layer as well as in the shell. It is an effective protection against foraging animals and insects, but it also attacks the human harvester's skin. Heat destroys some but not all of this caustic oil, and a good processing system still hasn't been developed. The nut itself also contains some of the caustic oil, so you cannot eat cashews raw.

Because of processing problems and limited supplies, cashews are relatively expensive though prices came down enough to compete with our lower-priced nuts.

Coconuts are a ubiquitous crop in the tropics. They are a true staple diet item for people who live in tropical low-elevation areas where coconut palms flourish. Coconuts are everywhere and are inexpensive. They use coconuts for everything, from sweets to alcoholic and non-alcoholic beverages and in foods of every sorts. They use every part of not only the nut but the tree for something. Coconuts are not nearly as popular in the North America, because they deteriorate fast. It is not often you can bring one home from the supermarket that still has much fresh coconut taste without a hint of rancidity or mold.

It is probably ocean currents that carried coconuts all over the world, so no one knows where their original home was. According to botanists the coconut is not a nut kernel inside a shell but a huge seed whose shell is lined with the white meat we know as coconut. The center of a mature coconut is empty except for a small amount of liquid which is not very good to drink. The coconut milk for cooking, that Asian recipes call for, is a liquid you make from the scraped coconut meat, not the liquid in the coconut itself.

Young coconuts, however, are different. A very refreshing, nourishing, slightly fizzy, sweet coconut water fills them, that tropical populations drank regularly until the U.S. beverage makers introduced soft drinks. Now they have a definite preference for the imported beverages.

Unlike other nuts, you eat coconut raw without cooking or roasting. When fresh, its flavor is excellent, but it is particularly high in saturated oil. The most common use for coconut is in grated form, either sweetened or unsweetened, for baking or in cooking. Southeast Asian curries use coconut milk, which you can make yourself from flakes or fresh coconut (if you can get fresh ones). Coconut milk is also available canned, frozen or dehydrated. Most Asian food markets carry a staggering variety of other coconut products, too.

Seeds are similar to nuts in both nutrition and composition. In our cuisine we only use seeds in small quantities, except by vegetarian and health food nuts. The major distinction between nuts and seeds is size. If it is tiny, we call it a seed, if larger, nut is a more appropriate term (even though the coconut is a seed). There's another distinction, though. Nuts grow on trees while seeds grow on small annual plants.

We use four kinds of seeds regularly in cooking—poppy, sesame, sunflower and pumpkin seeds. We don't use poppy seeds much in baking, except sprinkled over rolls or bread before they are popped in the oven. It is too bad because they have a unique and delightful flavor in dessert preparations. In many Central European desserts poppy seeds are a feature ingredient. Cooks never toast poppy seeds. Sesame seeds appear on home pantry shelves more and more often now that Asian cooking is so popular. They are very good raw but improve much on roasting.

We eat pumpkin and sunflower seeds mainly in snack foods, but more and more cooks toast them and add to salads for both flavor and texture.

Chestnuts don't follow nut rules. They are low in oil and high in starch, resembling wheat grain in their composition more than nuts. You can use them as a starchy vegetable in cooked preparations like turkey stuffing, yet they are true nuts. Very few American cooks are familiar with the potential that chestnuts offer. In the Mediterranean they are cherished, in particular in France, where they use chestnuts as vegetables, in soups and in sumptuous puréed dessert preparations that are in a class of their own. Italians are also fond of chestnuts, but more in its plain roasted form. Several parts of Southeast Asian cuisine use chestnuts, too.

Tedious, time-consuming preparation may be the main reason for chestnut’s poor reception in the America. Prepared canned chestnuts are available, but they don’t resemble fresh chestnuts at all. Fresh ones, on the other hand, are not always easy to find, and it is a very short time span when they are in season.

The chestnut tree is a distant relative of the oak, and is native to Southern Europe, Asia and North America. The mature trees are large and each one yields anywhere from 100 to 300 pounds (45 to 140 kg) of nuts in late autumn.

A great many native chestnut trees once grew in eastern North America, but a tree blight disease in the early 1900s wiped nearly all of them out. Now they are beginning to reappear in various parts of the country, especially where Asian population has settled, and fresh chestnuts are once again available from mid-October through December.

Freshly picked chestnuts are actually too high in starch and need to rest for a few days to give the starch time to convert to sugar. But this curing period must be short or they lose their moisture and dry out. Because of their high starch content, chestnuts are not edible raw—eating raw chestnuts is almost like eating raw potatoes, though they do have a mild, pleasant flavor and crunch while raw potatoes have none. But there is a drastic change when you cook or roast them,

which brings out the delightful flavor.

Cooking with Nuts and Seeds

There are fresh nuts, stale nuts and rancid nuts. Then there are raw nuts and roasted nuts. You find all five classes in grocery stores and on kitchen shelves. Once they are stale or rancid, the nearest trash can is the place for them. Because of their high oil content, fresh nuts stale and eventually turn rancid as the oil oxidizes. Stale nuts may still be refreshed but rancid nuts are beyond hope. Just like you cannot reverse the action of fire, you cannot reverse rancidity—both are oxidation. Nuts need to be absolutely fresh to be good—just like meat, fish, vegetables and dairy products—no matter what you use them for. To use stale nuts in the kitchen is like using wilted vegetables or over-the-hill meat. To use rancid nuts is like using spoiled fish or moldy cottage cheese. Don’t risk your food, discard them.

Most fresh nuts have excellent flavor, but heat enhances it so much that it should be considered a sin to eat them raw. The flavor change is truly drastic. Test it for yourself by comparing half a batch of fresh-roasted nuts with raw nuts. Roasting activates the browning reaction (see discussion under Browning reaction in the Meat chapter) and converts scores of flavor components into new compounds to orchestrate more pronounced, more pleasing, deep, three-dimensional flavors. Some nuts are almost bland without roasting. Roasting seeds is also a good idea, since compositionally the two are so similar.

When nuts or seeds are part of a recipe that you bake, roasting is not necessary—the oven heat activates some browning and flavor development.

Walnuts and pecans are very flavorful when raw, they benefit the least from roasting yet the flavor improvement is enough to justify the extra roasting time, especially if you use them in salads or in cooked dishes. Coconuts are the only nuts that we don’t roast.

Roasting nuts and seeds

Are you particular to have the best nuts and seeds in your cooking and baking? Then always purchase them raw and do the roasting yourself. Packaged pre-roasted nuts cannot compete with your fresh-roasting even if vacuum-packed with a label that guarantees them to be fresh. Nuts and seeds are somewhat like bread—as soon as they are out of the oven, they start to stale.

Roast nuts and seeds in a medium-hot oven (350°F or 180°C), and use the chart below as your guide only, for roasting time varies with each nut and seed. Nuts vary in size and age (moisture content) and ovens vary in temperature. Start checking a few minutes before the end of the roasting time. When you roast nuts in small pieces, they roast faster.

Roasting at lower oven temperatures increase time but the end result is the same. Stir the nuts or seeds once or twice during roasting for uniform results, particularly if your oven is blessed with uneven heat (as many older ovens do). As soon as they begin to brown and the kitchen smells divine, they are done. Once you remove them from the oven, they continue to brown for a few more minutes with the residual heat. That is why it is best to slightly under-roast instead of over-roast. It is easy to put them back in the oven for a little longer if you find they haven't yet developed full flavor after a few minutes of cooling.

Deep-frying or sautéing in small amount of oil also brings out the flavor, but adds more oil to the nuts. You can also roast nuts and seeds in a heavy sauté pan on top of the stove. This

takes more attention and constant stirring. Stove-top roasting is more suitable for small seeds which are very quick to brown.

The roasting flavor fades in a few days to a week, so to have the very best, prepare nuts and seeds in amounts you need for immediate use only.

You will get flavor improvement even if you re-roast previously roasted stale nuts. To revive the fresh-roasted flavor, heat in medium-hot oven for 4 or 5 minutes, just until the nuts are thoroughly heated but not yet browning.

Roasting Times for Nuts/Seeds
(350°F or 180°C oven)

Nuts	**Time in Minutes**
Almonds	11-12
Brazil nuts	9-11
Cashews	10-14
Chestnuts	18-20*
Hazelnuts	7-9
Macadamias	6-8
Peanuts	11-18
Pecans	10-12
Pine nuts	6-8
Pistachios	10-12
Walnuts	6-8
Seeds	
Poppy seeds	5-6
Pumpkin seeds	8-10
Sesame seeds	5-6
Sunflower seeds	11-12

* roast chestnuts at 450°F (235°C)

Properly roasted, fresh chestnuts have as scrumptious a flavor as any other nut, but they must be very fresh and home roasting is somewhat tricky. If the chestnuts are not fresh, the peel is hard to remove, and even if you manage that, an astringent skin (called *pellicle)* covers the nut meat that resists peeling until you learn the technique. It is an art that you learn by practice.

To solve the roasting and shelling problem, I browsed through articles, books and periodicals and I found several techniques. I tried one after another. Some didn't work at all, some worked fairly well, and I found a few methods that were consistently good. Whatever you use has to accomplish two things—develop the full roasted flavor of the meat and make both the shell and pellicle easy to remove. Here is the best method:

To prepare the chestnuts, slash a shallow "x" on top of each shell. A serrated bread knife cuts through the tough shell better than a small sharp knife. The “x” serves as a steam vent to keep them from exploding in the pan or oven. Their tightly sealed high moisture content makes popcorn out of your chestnuts, neither a pretty sight nor fun to clean up.

Deep fry the chestnuts at 375°F (190°C) in oil for 5 minutes. Both peel and inner pellicle turn so crisp that they readily crumble. Peel right away when cool enough to touch. This method

is a little messy because of the oil, but the nut meat soaks up very little in the process.

The next best method is less messy. Roast the prepared slashed chestnuts in a 450°F (235°C) oven for 20 minutes, sprinkling water over them every 5 minutes to keep them moist and soft. Peel as soon as they are cool enough to handle.

The chestnut industry is planning to market individually quick frozen chestnuts that are supposedly as good as fresh. Dehydrated chestnuts from Asia are available, too, but they have little flavor. Chestnuts also come in cans in the form of purées, creams, pastes and packed in sugar syrup, all imported from Europe. These products, though costly, have good flavor.

Tips from the chef

Pecans. Pecans are sometimes rather costly, depending on the harvest. Don't hesitate to substitute walnuts for them, even though the walnut flavor is more subtle.

Pine nuts. High prices often mean slow turnover in the grocery store, so the pricey little pine nuts may not be as fresh as you'd like. You can substitute fresh toasted pumpkin seeds or just plain walnuts anytime a recipe calls for pine nuts. The flavor won't be authentic, but will be better than using stale nuts, or, heaven forbid, rancid nuts.

Coconuts. Cracking and extracting the meat from a whole coconut takes some know-how. Freezing the nut whole overnight or baking in a 350°F (180°C) oven for half hour helps to separate the meat neatly from the shell. You can peel off the brown skin attached to the meat with a vegetable peeler.

Almonds. It was a common practice in the past to blanch almonds and many recipes still call for them. Blanching gives them a softer texture and milder flavor. Today we prefer fuller flavor. If you, too enjoy the fully intense almond flavor, don't blanch almonds, but roast them. Should you rather blanch, drop them in boiling water for 1 or 2 minutes. Test one to make sure the skin slips off easily before you drain and cool them under cold running water for a minute. Squeeze each kernel gently with fingers and it slips neatly out of the skin.

Almond paste and marzipan are two great almond products that pastry and candy makers use a lot. Almond paste is a homogenous blend of roasted finely-ground almonds, sugar and egg white. Marzipan, which is especially popular among European candy makers, is similar to almond paste, but has more sugar to make it stiff for easy rolling, shaping and sculpting. You start with almond paste, add sugar and corn syrup cooked to a firm-ball stage and blend. For good quality and not oversweetened almond paste and marzipan, make your own. Almond paste is really easy to make with a food processor, but marzipan takes candy making skill.

Almond paste

When a recipe calls for almond paste, nearly everyone writes adds it to the shopping list. Yet, if you have raw almonds in your kitchen, you can make it yourself in a food processor in a few minutes, and it will be far better and more satisfying than the commercial paste. Ready-made almond pastes are considerably sweeter than this one with 30 to 40 percent sugar, roughly the same amount as almonds in the paste. That is very sweet, but all that sugar ensures long shelflife and reduces the chance for rancid almond paste.

Most almond paste recipes call for blanched, untoasted almonds. But I like an intense flavor that only toasted, unblanched almonds produce. Should you prefer a milder version,

blanch and skin the almonds first. This recipe is the food processor version. If you are using a hand grinder, grind the nuts and add confectioners' sugar. Blend the rest of the ingredients into the nut-sugar mixture by hand.

Ingredients
1 cup fresh whole almonds
6 tablespoons sugar
¼ teaspoon salt
1 egg white
1 teaspoon almond extract

Procedure

1. Toast almonds in 350°F (180°C) pre-heated oven until slightly brown and scented, about 11 to 12 minutes. Process them with sugar and salt in a food processor until very fine, about 2 minutes.

2. Combine egg white and almond extract in a small bowl and add to the almond mixture through the feed tube while the machine is running. Continue processing another minute to reach a homogeneous paste.

This is a highly concentrated almond paste that goes a long way. For a turnover or similar pastry, for instance, you need only 2 tablespoons (1 ounce or 30 g) of this paste for each pastry. Since the paste is thick and sticky, for easier spreading you may add a few drops of hot water just before using it.

Makes 1¼ cups of paste. The shelflife, if refrigerated, is several months.

Seeds. Most people don't even consider pumpkin and sunflower seeds edible unless they are roasted and, true enough, their raw flavor is almost one-dimensional, flat, little oily and almost bland. It is best to pop them in the oven just before using them because the fresh-roasted flavor disappears in days. You can add both roasted pumpkin and sunflower seeds to salads and breakfast cereals. You can also use them as meat extenders and in many vegetarian dishes.

Cracking, chopping, grinding

If you buy unshelled nuts and the shells are very hard to crack, soak them in water for several hours or overnight to soften them just a little. It won't affect the nut meat, the shell is watertight.

Chopping a small amount of nuts without a food processor is quick on a large cutting board with a good chef's knife and a good chopping technique.

It is best if you fine-grind nuts yourself and it is easy if you have a food processor. They could end up as nut butter, though, if you over-process them, because of their high oil. Add ½ cup of flour or sugar for every cup of nuts (if the recipe calls for either) to prevent this. If neither flour or sugar is part of your preparation, process the nuts by pulsing them few second at a time and checking often.

Grinding seeds accentuates flavor. Middle Eastern cooks grind sesame seeds into a fine paste to make *tahini* and *halvah*. Europeans also grind poppy seeds when using them in pastries, giving them an altogether different, more intense flavor and distinct, soft texture. They use a

hand seed grinder for that purpose, which works slowly and tediously, but I haven't found a kitchen machine that can handle the tiny poppy seeds (nearly a million to a pound or half a kilo). The food processor blade just whirls them around without breaking them. Buying ground poppy seed make sense only if they are freshly ground. Like coffee, they deteriorate fast. The canned version is a poor substitute and not recommended. If ground seeds are part of your culinary repertoire, a good, efficient nut grinder should be part of your kitchen equipment for the best flavor.

Salting

To salt nuts or seeds, deep fry or sauté them in a small amount of oil, then sprinkle with salt. The salt will stick to the oily surface. For less oil, dry-roast them in the oven, drizzle them with the tiniest amount of oil while still-hot, then sprinkle with salt.

> **TASTINGS Nut Conversions.** Here are some useful kitchen facts:
> 1 cup nut meat yields 1¼ cups finely ground nuts
> To get 1 cup ground nuts, start with ¾ cup nut meat
> 1 cup small seeds yields 1¾ cups ground seeds.

How long will they keep?

Like any food with fat or oil, nuts oxidize rather rapidly and turn rancid. Rancidity destroys food, and even slightly to moderately rancid nuts become inedible. The higher the oil content, the more susceptible the food is to oxidation. And the higher the amount of unsaturated oil or fat, the faster it becomes rancid.

Nuts and seeds have a relatively high amount of unsaturated oil, so they are particularly susceptible to rancidity. In the shell, nuts are protected from microorganisms and rancidity. Once shelled and dried, the low moisture content (4 to 5 percent) gives full protection against attacks by microorganisms but they are still subject to oxidation. Refrigerating or freezing slows most chemical reactions, thus it also slows oxidation. If you could not resist that huge bag of shelled walnuts at such a bargain price at the farmers' market, store it in a cool, dry place or in the refrigerator or freezer, depending on how quickly you plan to use that much walnuts.

Toasted granola cereal

This high-protein cereal with added milk is about the healthiest food you can choose for breakfast. It has complete protein, high fiber and, depending on your serving size, modest fat, modest sugar, low salt and no cholesterol. And if you prepare it yourself, you know there are no chemicals or additives and it is not overly sweet.

Granola and muesli are both oatmeal-rich cereals with nuts, seeds and dried fruits. Muesli is simply the blend of all the raw ingredients, while in granola the nuts and seeds are toasted to give a richer, fuller flavor. They both became popular as American breakfast cereals with the advent of healthier, more varied diets in the 1970s.

Because it is unroasted, muesli is bland. That's why it was particularly popular in Britain where people blander foods. Oven-roasting muesli adds the flavor boost and it becomes granola.

Substitute nuts and seeds as you wish, provided the toasting time is fairly close for all. If not, toast them individually. (See roasting chart.) You can use dried fruits of any kind instead of, or in addition to, raisins. For reduced fat content, add more dried fruits and less nuts and seeds. Adapt the recipe to suit your diet and individual taste. But first try this original.

Ingredients
4 cups regular rolled oats
2 cups walnuts, coarsely chopped
2/3 cup unsweetened dried coconut (fine or medium grated)
2/3 cup raw sesame seeds
¼ cup raw wheat germs
6 tablespoons vegetable oil
6 tablespoons honey or brown sugar
1½ teaspoons vanilla extract
¾ teaspoon ground cardamom or cinnamon
1½ cups raisins or dried fruits

Procedure
1. Preheat the oven to 350°F (180°C). Mix oats, nuts, seeds and wheat germ by hand in a large bowl.
2. Warm the oil in a small pan, add honey (or brown sugar) and stir gently until well blended. Add vanilla and cardamom (or cinnamon) and blend.
3. Drizzle over the dry ingredients in the bowl and mix thoroughly by hand.
4. Spread the mixture in a thin layer in one or two baking pans and roast in the preheated oven for 15 minutes, stirring every 5 minutes for even toasting.
5. Remove from the oven and let cool for half hour. Put the granola back in the bowl and stir in the raisins or dried fruit by hand.
Store in airtight jars in a cool place or in the refrigerator.
Makes 2 pounds 3 ounces or 1 kg, about 10 servings.

Most seeds resist rancidity, because they are still in an airtight tough outside cover. They have a long shelflife until you grind them and break the skin. Other seeds have different protection—shells like nuts, such as pumpkin and sunflower seeds. Once you break that shell, they no longer have such protection and their shelflife is short—at room temperature a matter of weeks before you taste the first sign of rancid oil.

Industry standards are a good guide for us for keeping quality. Warehouses keep shelled nuts 3 to 4 months in cool, dry warehouses (a condition few of us can duplicate in our pantries), but as long as a year under refrigeration. With low-oxygen packaging, shelflife extends to 2 years. In the freezer, well-packaged shelled nuts keep for 2 years.

Vacuum-packed nuts are well-protected, but oxygen is not fully excluded from the package, so eventually they turn rancid, too. Canned nuts also have good protection. They are either vacuum-packed or oxygen is replaced by an inert gas to prevent rancidity. Once you slice or chop nuts, they deteriorate even faster because you suddenly exposed much larger surface to the oxygen in the air.

Even though coconuts and chestnuts are perishable subject to mold and desiccation,

supermarket produce managers refuse to allocate space for them on the more costly cool shelf with the vegetables, where they belong. Chestnuts especially detest being put in the warm center aisle with the rest of the nuts, and rightly so—they belong with the vegetables.

Points To Remember

- Nuts and seeds are high in proteins but also high in oil and calories. The saturated oil content is relatively low except in coconut. Chestnut is an exception—low in oil but high in starch.
- We have 13 kinds of nuts and four kinds of seeds that we regularly use in the kitchen.
- Nearly all nuts and seeds benefit from roasting with dramatic improvement in flavor. Pecans and walnuts are flavorful even when raw but they still gain from roasting. Fresh-roasted flavor fades fast so roast just enough for short-term use.
- Previously roasted but stale nuts also benefit from to re-roasting.
- Always buy nuts and seeds very fresh and preferably whole. Chop and grind them yourself for optimum freshness and longest keeping quality.
- Unshelled nuts have long shelflife, but you should keep shelled nuts in a cool, dry place, or refrigerated and frozen storage. They oxidize quickly and turn rancid.
- Coconuts and chestnuts are perishable like vegetables.

A gourmet who thinks about calories
is like a tart who looks at her watch
James Beard

THE CARE AND FEEDING OF A SWEET TOOTH

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Last but not Least

No one has ever solved one of the great mysteries of eating. All of us have experienced it, some of us frequently. You have just eaten a wonderful multi-course meal and are so full that you don't know how you managed to swallow those last few bites. You are really stuffed! Suddenly dessert arrives—it looks truly sumptuous. There is no diplomatic way you can pass. A few minutes later you look down and your plate is empty. You were able to finish that rich dessert without any problem.

The only plausible explanation is that dessert goes into a different stomach, a second one that is reserved just for that last sweet course. No wonder that no matter how full you are, you always have room for dessert.

Don't desert the dessert

Most human beings have a craving for sweets. Certainly any discriminating eater feels a meal is not complete without dessert. Psychologists and anthropologists believe that they can trace this powerful attraction for anything sweet to our ancestors. The human body in its natural state recognized the high energy and quick replenishment provided by natural sweets—ripe fruits, honey, sugarcane. This craving has stayed with us, probably even intensified, along with other neurotic obsessions. Sugar in its many forms is one of the most widely consumed foods and most humans eat it on a daily basis. Americans devour on the average 143 pounds (65 kg) of sugar annually from all sources. That translates to nearly *one cup* of sugar every day. Could that be possible? And do you eat your fair share?

Every cuisine in the world has some culinary means to satisfy the sweet tooth, but how people satisfy it varies enormously. Western-style desserts are common in all countries where cuisines are European-based. For instance, South American countries make their last course the sweet finale, but where the European influence is minor, as in Central America, an actual dessert course is little known—they serve sweets in other forms than a last course. In Asian countries, ending a meal with a sweet is even less common. When Asians do serve dessert as a result of European influence, it is a simple preparation like pudding, custard, sweet gelatin or fruit. Even these they generally reserve for ceremonial and festive occasions.

The best-known Chinese "sweet" is the fortune cookie, which some brilliant individual actually created in California. Chinese in some regions serve small sweets to rejuvenate the palate between courses of highly seasoned foods. But Asians usually get their sugar fix by drinking many cups of highly sweetened tea, sometimes coffee, fruit or other artificial beverage preparation with one thing in common, the high sugar content, often in the form of sweetened condensed milk. Asians even prefer their canned soft drinks sweeter—soft-drink formulas in many Asian markets have higher sugar than American formulas of the same beverage.

It is unknown why the discrepancy between the western and eastern type desserts. One possible explanation is that very few Asian households, including the wealthier Asian nations, have had electric or gas ovens. The ovens that do exist are often fueled with wood. Baking European-style concoctions requires good temperature control that is difficult with wood fire. Another unknown is why, over the centuries, different European cuisines developed in diverse directions in their foods, yet the evolution of their desserts followed similar lines.

Desserts and desserts

The huge variety of dessert preparations demand a system to classify our recipes when planning that final sweet course. Most of the sweets we commonly prepare fit into the following nine categories:

- Cakes and tortes
- Cookies and bars
- Pies, tarts, cobblers and their cousins
- The mousse clan
- Crêpes
- Yeast-leavened desserts
- Frozen sweets and ice creams
- Fruit desserts
- Desserts outside pigeon-holes

I recommend you get comfortable by practicing a recipe or two from several of these categories. Then you can pick a dessert from your recipe files for any occasion to fit into your time frame, the season, the event, the type of meal and the ingredients on your shelf. Mastering the technique and being at ease with a few fundamental techniques are essential, for instance, preparing pie dough, cooking custard, working with chocolate or frosting cakes.

Sweet prerequisites

Preparing a scrumptious dessert, particularly baked desserts, requires a completely different culinary expertise than other kitchen tasks. It is far more exacting with little latitude for error. A soup can often be corrected if you forget a step in the preparation. A yeast bread is still edible, even good, if you add one tablespoon of sugar instead of one teaspoon. In baking, a small error can lead to a frustrating cake, cookie or pie pastry that only the cook will eat, and then only when starvation is imminent. Despite this, many excellent desserts are reasonably easy and quick to make. There is just no place for a freeform cook in a pastry kitchen. And that may be the reason that many, many good, competent home cooks completely abstain from dessert preparations, except baking simple coffee cakes with ice cream on the side.

Even the training of pastry chefs is a separate branch of culinary schooling. Many chefs not trained in pastries do nothing but the simplest of desserts. But you don't need pastry schooling to prepare excellent home desserts. For serious dessert-makers, there are several excellent cookbooks that dwell on the varied art of dessert preparations. I am not going to compete with them. What I offer here is a broad and detailed summary of dessert making, the basics of the hows and whys with sprinkling of physics and chemistry (that virtually all cookbooks omit), and a discussion of the pros and cons of various ingredients and techniques. It is a detailed collection of references. Knowing these takes extra effort on your part but makes you a better, more confident pastry cook.

Many, if not most, dessert preparations require specific techniques that take experience and practice. Take a simple thing like preparing a pie dough. Unless you do it often, you tend to forget about the small but important points that are so necessary for success. Get into the habit of writing down techniques and your own findings on your recipes as a reminder for next time. Armed with these, you should at least be able to define what went wrong when the results are not up to your expectations.

The work becomes easier and the product more professional looking each time you repeat

a preparation. If your goal is to master the whole spectrum of desserts, you will need to add a dessert course to every meal of the day to allow for practicing. In a pastry kitchen there is a lot to learn, but getting there is full of fun and it is very rewarding. If you eat the result in moderation, even your waistline will not suffer.

Dessert Ingredients

Dairy

Dairy products are essential ingredients in many dessert items. They are often in the form of butter, cream and milk, providing fat, flavor and moisture. Less commonly the dairy is sour cream or yogurt. I discuss dairy products in the chapter Unscrambling Dairy and Eggs in great detail. Please refer to that for more information.

Flour

What flour you choose has bearing on the final result of your dessert preparations, less os for some preparations than for others. Generally two types of flour are common in pastry kitchens, all-purpose with average starch and protein contents and cake flour with high starch, low protein contents. The term soft flour also refers to high-starch flour, but that may not be the same as cake flour. Cake flour explicitly implies the highest starch and lowest protein contents plus extra fine milling to produce tender, crumbly cakes with lightest texture. Bread flour with its low starch and high protein is only useful in a few types of desserts. Even sweet yeast preparations don't benefit from using bread flour.

> **TASTINGS Protein and starch in flour**
> Hard wheat flour that is ideal for bread making has 12 percent protein, while a soft cake flour contains 7.5 percent. All-purpose flour is a blend with around 10.5 percent protein. As the amount of protein goes down, the starch content goes up, since protein and starch are the two main ingredients of flour.

If you don't have cake flour on hand when a recipe calls for it, you can increase the starch content of all-purpose flour by adding 3 tablespoons cornstarch to a measuring cup then fill the cup with flour and blend.

In some regions of the U.S. (particularly in the South and Southeast) you can also buy pastry flour. This is also a high-starch flour but not as high as cake flour and it is excellent for baking powder breads.

Self-rising flour is simply all-purpose flour premixed with baking powder and salt, ready for baking. Avoid it. Mix your own instead both for economy and to avert the risk of stale baking powder if the self-rising flour had been stored too long. If a recipe calls for self-rising flour, add 1 teaspoon baking powder and 1/8th teaspoon salt to every cup of all-purpose flour. Mix well and you have fresh self-rising flour.

Sugar

Sugar is sugar.. There is not much you can vary with sugar as an ingredient. Yet there is some difference. Every sugar particle is a single crystal and should you look at sugar under a microscope, these crystals are sharp, angular. The sharp corners help to trap air bubbles and add volume to batters during their rise in the oven. Should you substitute the very fine icing sugar, the

bread or cake would not rise as much because the crushed crystals are tinier and not as pointed. Conversely, you cannot substitute granular sugar for icing sugar in a cake frosting (except in recipes where you dissolve the sugar first), because with granular sugar you will never get a smooth, velvety, silk-like texture so desirable in frosting. In addition, icing sugar contains 3 percent cornstarch (to inhibit clumping) that changes the correct ingredient proportions.

Sugar also contributes to moistness of baked desserts because of its ability to retain water (it is hygroscopic). Low-sugar baked products dry out faster.

Finally, sugar has important contribution to flavor through browning. On heating, sugar goes through a tremendous number of chemical changes. At a little below 350°F (175°C) it changes color to amber, then darkens to caramel, and develops an intense flavor. The process is called caramelization and that highly-desirable caramel flavor permeates whatever you are baking.

Eggs

For any food with egg as ingredient, the fresher the better. This is especially true when egg is the star performer on your plate, like in scrambled, fried or cooked eggs but also in most desserts. Our choices when buying eggs, however, are not very good, and it is a rare buyer who can be certain of getting fresh eggs. The tips in Unscrambling Dairy and Eggs chapter help you in your selection though most of us just pick the first carton of eggs in the supermarket egg case without thinking freshness.

Recipes call for standard large eggs. Should you be using other than large, refer to the conversion table in the egg chapter.

Foam from egg whites

Whether you fold the egg white foam into a cake batter or spread over a pie as a meringue, the way you whip it into a foam is crucial. In a nutshell, put the egg whites into a bowl and whip with an electric or hand beater until a proper foam forms in a few minutes. But with poor whipping technique you achieve poor volume. With even poorer technique, you may have no volume at all. The egg whites may even stubbornly refuse to turn into foam.

To get the *maximum* foam possible, however, takes more than this simple step. First, start with egg whites at room temperature. Cold egg whites don't produce maximum volume and neither do very fresh eggs. (Unless you have egg-laying hens, today you don't have to worry about too-fresh eggs.)

Second, both bowl and beaters must be clean and completely free of fat or oil. Even a minute amount in the egg whites reduces, or may prevent, foam development. And since egg yolk is made up of 31 percent fat, you must be careful that no a trace of yolk sneaks into the whites when separating.

Plastic bowls are not ideal for beating egg whites because they may retain traces of fat or oil no matter how well you clean them. Avoid aluminum, too, which tends to discolor the foam, that leaves stainless steel, glass, ceramic or copper bowl. A copper bowl produces the best, most stable, highest volume foam with a slight yellowish tinge. If you happened to have one, clean it first with a little vinegar and hand beat egg whites in it. Egg whites quickly turn into foam with ease. Food scientists have explained the complex chemistry of interaction of egg whites and copper, but that is far beyond the interest to most of us.

TASTINGS Egg white foam chemistry

Four different types of proteins in egg whites interact to produce the cake structure. Two (*globulins* and *ovomucin*) give stability owing to their viscosities to the still liquid foam, the third (*conalbumin*) helps to stabilize it temporarily at room temperature, and the fourth (*ovalbumin*) gives it a permanent stability after you heat the structure in the oven. Once the foam with the other ingredients are in the hot oven, the trapped air expands as a result of heating, and the cake rises.

Hand beating egg whites? Nearly all of us consider this chore as something of the distant past, that our small appliances have eliminated, and good riddance. Yet, any accomplished cook should know the technique of hand beating for those times when you need only one egg white or ¼ cup cream whipped. Few machines do a good job on small quantities. With a wire whip and a small bowl you can whip egg white or cream easily in a few minutes.

But for now let's just whip egg whites with a mixer. You have the egg whites in a clean, oil-free bowl at room temperature. What else do you need to know? It helps to start off beating slowly for a minute, then gradually increase the speed to high. Small bubbles are more stable than large bubbles. Starting slowly tends to produce small bubbles, and as you increase the mixer speed to high, small bubbles continue to dominate the foam building it into a more stable foam. Should you turn the mixer to high right away, larger bubbles form early, and the resulting foam will be somewhat less stable.

Sugar also stabilizes the foam, gives it more power to rise and additional structural strength to the baking cake. Slowly add sugar as peaks barely begin to form. If you add the sugar too soon, it interferes with the beating process. If you add it too late, the foam may become too stiff by the time you incorporate and dissolve all the sugar.

Beating intersperses air in the egg whites and that is what foam is, a semi-stable material. Don’t let it stand too long, or the air bubbles pop, the volume decreases. When baking with egg whites, plan on a continuous action from whipping to baking.

How long to beat the egg whites is crucial. If you stop beating them too soon, not only you get less volume, but some of the partially beaten liquid drains away, dragging and collapsing bubbles along. It may even partially liquify the foam. If that happens, start beating again, you can still rescue the egg whites.

Overbeating causes the proteins in the egg whites to coagulate and clump up, also resulting in less volume. You cannot rescue overbeaten egg whites. They have high, dry peaks that are so stiff that they don't fold easily into the batter. You lose volume and the cake doesn’t rise much.

How can you tell when to stop beating egg whites? As beating, watch for five stages they go through:

1. You reach the first stage when the egg whites begin to hold their shape slightly.
2. At the next stage, you already have soft peaks but they don't hold well, still fall over.
3. The third stage is the point at which the peaks hold their shape but are still quite soft. This is the ideal stage for folding into cake batters.
4. The egg whites are stiff but not dry in the fourth stage. This stage is perfect for meringues.
5. In the final phase, the whites are both stiff and dry. This is one step beyond any culinary purpose but great for tossing around at wild parties.

To stabilize the foam you want to have a slightly acid environment. Adding a small amount of cream of tartar at the beginning stage (¼ teaspoon for every 4 eggs) acidifies the egg whites. The

cream of tartar also has a bleaching effect, resulting in a whiter cake. A small amount of salt also stabilizes the egg white foam, but it interferes with the flavor.

Folding in the foam

Folding is an art that you best learn through experience and watching expert bakers. A rubber spatula is the best tool for folding (what did bakers use before the rubber spatula?). Some cake and most torte recipes call for folding egg white foam into a mass of batter, rather than batter into egg white foam. In either way, the closer the two are in consistency, the easier and more efficient the folding.

If the batter is too thick, a good trick is to stir about a quarter of the egg white foam into it to lighten its consistency, even though you sacrifice quarter part of egg foam. Then gently fold the rest of the foam into the batter in two or three batches. Take your time and be patient. The air pockets are very fragile. Professionals fold with a gentle scooping action, from the bottom up, while turning the bowl slightly after each fold. As soon as the result looks respectably homogeneous, stop. Pour the batter into the pan and slip it in your oven.

Egg yolks

Many desserts use only egg yolks, many use whole eggs and some call for both—whole eggs plus extra yolks. Egg yolks add richness and increase the quality of desserts because they contain all the flavor of eggs (egg whites are flavorless). They also contain *lecithin*, a good emulsifier that helps a cake batter retain air bubbles, and produce a lighter, fluffier cake. Egg yolks also add a pleasing yellow color to any dessert.

Whipping cream

A favorite, in fact, an indispensable ingredient in French baking is heavy whipping cream. Like whipping egg whites into foam, beating cream into light billows of clouds of whipped cream is not difficult but takes some know-how. Please read about it in detailed, full discussion in under Unscrambling Dairy and Eggs.

Gelatin

Thickening with gelatin is nearly foolproof if you follow the package directions. But the results are even better if you understand gelatin and the process of how it thickens liquids.

Gelatin is a protein that the skin and bones of all animals and humans contain. It is very nutritious, and that is one reason why meat-eating animals gnaw on tough skins and bones. Gelatin in a living creature is in the form of *collagen*, a stiff organic substance that provides support and strength to tissues and organs. Gelatin manufacturers derive powdered gelatin from animal bones and skins and that's why strict vegetarians cannot eat food made with gelatin.

This strange substance, gelatin, has the amazing ability to absorb 5 to 10 times its weight in water, and, after it reaches a certain temperature (appropriately termed gelatinization temperature), it stiffens as it cools into the familiar soft but stable gel.

Here is the way to use gelatin. Sprinkle the powder over a small amount of cold water (never the other way around by stirring cold water into the gelatin powder) to let it soften and swell

for a minute or two. Professionals call this step *blooming*. To activate gelatin, it must reach 140°F (60°C), the gelatinization temperature. Without bringing the liquid with the gelatin to this temperature, it will not gel your liquid. If you don't use a thermometer, bring the liquid to hot but make sure no to boil. Boiling loses some of gelatin's setting ability.

In cooling, the next process, the unstructured molecular chains of protein crystallize into molecular aggregates and eventually into a three-dimensional crystal structure. Don't agitate the liquid during cooling as it interferes with the process. Occasionally you may stir very gently.

When the cooling temperature drops below 75°F (25°C) the three-dimensional structure begins to set into a gel (the setting temperature is lower in acid liquids). By the time it reaches refrigeration temperature, it is a stiff, semi-solid gelatin. Set your timer if your recipe calls for folding ingredients into setting gelatin to remind you before it becomes too stiff. Should the setting go too far, it may reaches the point of no return, and folding becomes impossible. If that happens but the gelatin is still not fully set, immerse the container into a bowl of hot water—the heat may soften the gelatin enough for you to fold. If that fails, start again.

Follow recipes exactly with gelatin—using too little, and your liquid does not set stiff enough. Using too much, you may get the consistency of rubber ducky. As a rough guide, one packet (2¾ teaspoons) sets 2 cups of liquid.

To unmold gelatin desserts, dip the dish into a bowl of very hot water for about 5 to 10 seconds. The gelatin near the contact with the dish softens enough that it lets the entire mass slide out on a platter. The most efficient way to do that is to place your serving platter up-side-down over the gelatin mold and turn them together right-side-up. If the gelatin doesn't release from the mold, let it sit over the serving dish for a few minutes, and hope it will release. If still not, try the hot water again.

Gelatin packages warn you, and many cooks know it, that you cannot use some fresh fruits in gelatin desserts. An enzyme in them deactivates gelatin's setting property. After you cook these fruits, however, you deactivate the offending enzyme. These fruits are fresh pineapple, fig, kiwi, papaya, honeydew melon and ginger.

Rarely you may see recipes calling for sheet gelatin. European kitchens like to use these, but they are not readily available on this side of the Atlantic. They are identical to our powdered gelatin but are in sheets.

Chocolate

Easy to eat, loved by everyone, chocolate, nevertheless, is a tough one in the kitchen. I don't mean baking with it as in brownies—that is hardly a culinary headache. But in any preparation calling for tempered chocolate you need plenty of knowledge and experience—working with it is both an art and a science. It is a highly specialized part of baking with complex physical and chemical reactions. Working with chocolate involves information that are book-length and beyond the scope of this book.

Yet every cook should know at least the basics of chocolate. Complex or not, chocolate or cocoa is one of the top favorite ingredients in everyday baking.

Baking chocolate contains various alkaloids that effect the human body, most important of which are *theobromine* and *caffeine*, both stimulants. But far more important effect is its incomparable flavor. To many, nothing in the entire culinary repertoire can come near to the hedonistic pleasure of eating chocolate, and there is certainly no substitute for it.

How to make chocolate

Cocoa beans are similar in shape and size to coffee beans, and both are nearly odorless and flavorless in their raw stage. It is the roasting process that brings out coffee's aroma and flavor, while a combination of fermentation, drying and roasting produces that astonishing chocolate flavor we adore, and some of us become addicted to. Strangely enough, many of the aromatic chemical compounds are similar in the raw beans for both coffee and cocoa.

The fruits that house coffee and cocoa beans are very different. Cocoa beans grow in a good-sized fruit resembling both in size and shape to a down-pointed papaya. It turns from green to purple, then bright yellow as it ripens while the cocoa seeds grow in a mucilaginous mass inside. The harvesters cut the fruit open by hand, scoop out the seeds, and pile them up in large bins for the first step of the process, fermentation. The carbohydrate-rich pulp ferments, producing alcohol, carbon dioxide and acetic acid. This chemical process generates enough heat to deactivate enzymatic action working in the beans, preventing further ripening or spoiling. The heat also decomposes the pulp enough to free the seeds.

Fermentation takes anywhere from 3 to 10 days. By that time, the seeds are juicy, plump and dark brown and, after drying, they give off a faint chocolatey aroma. Then the processor roasts the dried, almond-shaped beans for an hour at a relatively low temperature of 250°F (120°C). The roasting process drastically alters the beans' chemistry, and creates about 300 different new chemicals while it also develops the full chocolate aroma.

The final step is to crack the cocoa beans and remove the hard outer shell. They also remove the innermost part of each bean, the seed germ to prevent spoilage, a process similar to the degermination of wheat kernels to produce white flour from whole wheat. What is left is called the *nibs*, the meat of the cocoa beans which is 50 percent cocoa butter. In spite of the high oil content, the nibs have considerable storage life thanks to its built-in natural anti-oxidants. Next, the processor grinds the nibs, an action that generates enough heat to melt most of the cocoa butter, that results in a brown viscous liquid they call *chocolate liquor*. After cooling this liquid solidifies into unrefined baking chocolate and this is the basis of all cocoa and chocolate products.

How to make cocoa

A Dutchman named van Houten patented an ingenious method in 1828. His process was to squeeze the fat from the cocoa butter under pressure, leaving a dry block of cocoa like a chunk of dark brown coal, that he could grind into fine powder, the same cocoa powder you buy at the market today. This was a significant step, because the original high-fat chocolate was heavy on the stomach, even for the more physically active Victorians.

It would be a shame to waste the excess cocoa fat. It has a pleasant chocolatey aroma, a deep rich brown color and a particularly desirable physical property—it melts at body temperature. What is a better use for cocoa butter than in the cosmetics industry where it finds many applications? Any cocoa butter the cosmetics people cannot use is a perfect animal feed. (Do cocoa butter-fattened pigs develop chocolate-flavored bacon?)

Refining and perfecting chocolate

Baking chocolate and chocolate candy bars came many years after van Houten's cocoa. In 1847, an Englishman, Joseph Fry, patented a process for producing blocks of chocolate that

remained solid even in warm weather. This chocolate was something like today's sweet baking chocolate. Before his process chocolate was like butter—it became soft and eventually melted in warm weather.

In 1875, a Swiss, Daniel Peter, discovered that adding condensed milk to this hard chocolate produced a much more pleasant, velvet-smooth, delightfully delicious product that we now know as milk chocolate.

Another Swiss, Rodolphe Lindt introduced a still further refinement. He discovered that forcing the liquid chocolate repeatedly between rollers for several days (called *conching*) heated the mass, evaporating moisture and volatile acids. He then cooled this slowly, a process all serious bakers using chocolate still employ, called *tempering*. The result was a mellow-flavored, smooth-textured chocolate product, even smoother and more pleasurable than milk chocolate. The manufacturing process was also simpler. Before the discovery of conching, the processor pressed the chocolate into molds. But conching allows chocolate manufacturers to pour chocolate directly into molds.

Chocolate candy bar

Chocolate makers first test marketed chocolate bars, as we know them today, around 1910—consumers accepted them immediately, unconditionally and with enthusiasm. The Hershey Company offered the U.S. armed forces an improved, new high-energy, heat-resistant, nutritious chocolate concoction in 1937, which they called the Logan Bar. They produced 90,000 of these bars for field testing. The military didn't like the name so they renamed them, giving a more soldierly name Field Ration D Bars, and, in spite of unpalatable name, the chocolate bars were a hit with the soldiers.

During World War II, the American military issued its troops generous chocolate bar rations as a source of concentrated quick energy and eating pleasure. One of the most pleasantly remembered times for Eastern and Central Europeans was the arrival of the liberating American tanks filled with smiling GI's and sacksful of chocolate bars. The GI's passed out chocolates to the weary and hungry crowds lining the streets. The liberating British and Russians brought freedom from war, too, but, alas, no chocolate bars.

Varieties of chocolate

Cocoa and chocolate, the two items I've talked about so far, are the cocoa bean products everyone is familiar with, cooks and non-cooks alike. But there are some variations in these two products that we also need to be familiar with.

Chocolate comes as unsweetened, bittersweet, semisweet and sweet, with increasing amounts of sugar as the only variable. It doesn't matter which one you use in your kitchen. For a matter of convenience, it is best to stock just one kind, become familiar with it and stick with it. Once you have a conversion table handy, you can quickly change the recipe from one kind of chocolate to another. Many basic cookbooks, like *The Joy of Cooking*, have this conversion table. My preference is to stock only unsweetened baking chocolate—that has the most chocolate in it, and by adding the right amount of sugar, I can create any other chocolate variation I need.

TASTINGS Fat content of chocolate products

Product	Fat content
Unsweetened	55 %
Semisweet	40-50 %
Sweet	35 %
Cocoa	10-25 %

Cocoa powder available in retail has varying amounts of fat content in the 10 to 22 percent range. Most of the common brands of cocoa you buy in the grocery store has 10 percent but restaurant and institutions tend to use the higher fat-content cocoa for richer, more satisfying hot cocoa drinks.

Today, with our increased awareness of the detrimental consequences of too much fat, processors can remove almost all of the cocoa butter, allowing packagers to label some of the chocolate cookies and other chocolate goodies as low-fat or fat-free.

Chocolate terms

The name *German chocolate* (the Baker's Chocolate Company's trade mark) does not refer to the country of its origin but to the name of the person who developed a process of conditioning the chocolate against heat.

The other term you see commonly on supermarket packaging is *dutch cocoa*, that is the same as *dutch process cocoa*. This term does refer to Holland, where they first introduced *"dutching"* of cocoa powder. This is a process to change the cocoa to have a darker color, richer tone and better solubility. However, the process also makes the flavor milder. To dutch cocoa, they boil the cocoa bean nibs in a 2 percent potassium carbonate and sodium carbonate solution before processing. This changes the pH of the cocoa from slightly acidic (its natural state) to neutral or slightly alkaline. Cocoa that is not subjected to this process is called *natural process cocoa* in the trade. You may also come across the term *European-style cocoa*. This is the same as dutched cocoa.

What about *white chocolate*? Its popularity is on the rise in food-trendy groups. You probably didn’t know, but this product is not chocolate at all, just the fat part of cocoa beans without the chocolate, to which they add milk solids and sugar—not much more than fat and sugar, in other words. The reason for its popularity is strictly in its unusual appearance—a chocolate-flavored product that is white.

Strictly and technically speaking, it shouldn't be called chocolate. In fact, next time you are shopping, check this—the product you buy as white chocolate on grocery store shelves they call "white baking bar," and cocoa butter is not even one of the listed ingredients. The fat is usually palm kernel oil, a much cheaper ingredient, along with a variety of added chemicals and flavorings. I ban it from my kitchen.

Chocolate and cocoa storage

Cocoa butter (the fat in cocoa beans) has a remarkably long shelf life. Among its numerous ingredients, chocolate beans include potent natural anti-oxidants (polyphenolic compounds) that protect the cocoa fats from rancidity. You may store chocolate and cocoa for years (some say indefinitely) without any deterioration in quality. Hershey’s scientists claim that after two or more years baking chocolate loses some of its flavor and may even have some rancid flavor notes. To be

on the safe side, don’t store baking chocolate any longer than a couple of years.

Eventually baking chocolate loses its brown sheen as the fat migrates to the surface, particularly if your storage area is quite warm. This doesn't affect quality, just appearance. As soon as you melt the chocolate (or eat it), the remaining fat homogenizes readily in the mixing bowl (or in your mouth).

Successful Baking

Baking is a very precise kitchen pastime. You can fiddle with some dessert recipes, for instance, reducing the amount of sugar or eggs in a mousse, and you will still end up with a good mousse of only a slightly different flavor or consistency. Not so with pastries, cakes or cookies. Altering the ingredients just may produce something only good for a hungry goat (goats eat anything). Tampering with the proportions of sugar and fat affects how the raw material is going to behave in the complex chemical and physical process of baking.

What a good recipe does is give you the correct proportions, based sometimes on centuries of trial and error, modified only slightly by knowledgeable and patient contemporary bakers to compensate for modern ingredients and changing tastes.

Serious bakers and professionals use the most accurate means to get exactly the right amount and proportion of ingredients, not unlike chemists in their laboratories. They avoid measuring cups as not accurate enough, and use fine kitchen scales instead to obtain the precise and consistently reproducible amounts. They measure by weight not only flour, sugar, cocoa and nuts but liquids and even eggs. A large egg, for example, should be exactly 2 ounces (55 g) but they are not always so. When a recipe for a torte calls for 8 large eggs, you want 16 ounces (455 g) not 15 or 17 ounces (425 or 480 g). The one once (30 g) difference may be critical for perfect result. No wonder serious pastry baking turns off so many cooks.

Modern food science is now coming up with the reason for those exact ratios and specialized techniques prescribed in recipes. Here I'll go through some of the basics. If you are already beyond these, invest in a good book on baking, one that includes more than recipes. It is helpful to understand why you are doing something, not just doing it because the recipe says so.

Temperature of ingredients

Most cookbooks say to start with ingredients at room temperature. They are right, but why? Butter or other fats form an emulsion (a stable suspension of liquid in fat) with sugar and eggs. It just so happens that you create the optimum emulsion at room temperature, 70°F (21°C).

Plan ahead and take butter, eggs and any other chilled ingredient from the refrigerator to let them warm up. If you must use butter right out of the refrigerator, cut it up into small chunks and place it in your mixing bowl. Turn the oven on for about two minutes, then turn it off. The temperature of most oven should be around 90°F (30°C). Put the bowl and butter in the oven. In less than half hour the butter should be close to room temperature. Check it once or twice, you don't want to melt it—melted butter will not cream even after it has cooled down. If you know your microwave well, that may be a good place to warm up butter. But most tend to partially melt them.

When you have to cream your butter with sugar, a suggestion from a baker to remedy cold butter works well, too. Heat the sugar in a saucepan until quite warm but not hot. Mix chunks of cold butter with the sugar and in no time the butter is soft enough to cream.

Eggs are easier to deal with. Plop the unshelled egg into a bowl of very warm water. It takes

minutes to warm them up. While you don't need to be exact, eggs should be within five degrees of that optimum temperature for the best emulsion and also for beating egg whites into the highest foam. A thermometer, of course, is quite helpful until you can estimate a comfortable 70°F (21°C) room temperature by touch.

Mixing the ingredients

The purpose of creaming is to whip as much air as possible into the softened fat, air that contributes to a baking a light cake. You can either use an electric mixer or beat vigorously with a spoon. If you are using the mixer, it takes about half a minute at medium to high speed. Continue beating at the same speed while slowly adding sugar over another half-minute period. Keep beating for 4 to 5 minutes (at least twice as long by hand) until the batter changes to a milky color. This is your signal that you have incorporated the maximum amount of air. Stop occasionally to scrape off the sides of the bowl to include all the fat in the thorough workout.

The next step is to form the emulsion. Add the beaten eggs, including any liquid flavorings, very slowly in a thin trickle. Ideally, this should take about 4 minutes. It produces a better emulsion than adding one egg at a time as most recipes instruct you.

Besides forming an emulsion with the shortening, the egg yolk has 30 percent natural emulsifier, called *lecithin.* When you heat the batter in the oven, the natural emulsifier binds ingredients that helps to build the cake structure. Not only creating volume and tenderness, eggs also provide a mild but distinctive flavor and plenty of nutrients.

The last thing you add is the dry ingredients. Don't use an electric mixer for this step or you will wreck the structure you so carefully built, letting most of the trapped air escape. Fold dry ingredients gently into your batter, half a cup at a time. Most bakers use a sifter that distributes the flour uniformly over the surface and fold it in with a rubber spatula. Fold just until you cannot see any more flour. The more you fold and the heavier your hand is in the operation, the more air you lose.

Baking

In most baked desserts you will find either eggs, flour or both. How does that soft, liquidy batter becomes solid? It is the oven heat that changes proteins in both eggs and flour proteins to slowly solidify the structure. Heat also affects the starch in flour—it gelatinizes it. Starch is basically many glucose sugar molecules linked together to form chains. At a certain temperature, the molecules absorb water and they become a single gelatinous mass. Watch this gelatinization process when making a sauce with starch or flour. The point at which the starch gelatinizes is when the sauce thickens and turns transparent.

Gelatinization happens between 140° and 148°F (60° and 65°C). The starch turning into gelatin and the proteins solidifying are the two processes that establish the structure in most baked items—cakes, tortes, muffins, cookies, and so on. But eggs also contribute to the solid structure. Eggs coagulate between 144° and 158°F (63° and 71°C), and that is when the framework begins to solidify. Around these critical temperatures, when eggs coagulate and starch gelatinizes, the batter is highly unstable and it must not be disturbed. That is the time cakes fall if you are not careful.

Correct oven temperature in baking is critical. If you haven't checked your oven thermostat recently (they do go out of adjustment over time), now is a good time to do it. Slip an oven thermometer in, turn the oven on and see if the thermometer matches the setting on your

temperature dial you have selected. Most ovens are simple to adjust. Remove the oven temperature control knob and look for a tiny screw inside the shaft that controls the level of heat. Adjust with a very light touch. Ovens with electronic controls are particularly easy—just follow your manual's instructions.

Baking at high altitude

At higher altitude we need to change a few things when we bake with leavening (yeast or baking powder). As you travel to higher elevation, the atmospheric pressure becomes lower (remember Physics 101?), and a leavened batter or dough requires less effort to puff up. So if you use the same amount of leavening agent in your sponge cake in Albuquerque, New Mexico than in Brantford, Ontario, your cake in Albuquerque becomes enormous, misshapen and perhaps falls over because it over-rises. There is not enough pressure in the atmosphere to keep it down to its proper height.

So what do you do? Use less leavening when you bake at an elevation of over 3000 feet (900 m) and raise baking temperature. If you live at higher altitude, consult a local cookbook for detail. A good cookbook gives you a number of points you want to observe so your cakes, breads, muffins and soufflés come out from the oven as if you were in Brantford, Ontario.

Cakes and Tortes

Cakes are favorites in all western cuisines, while tortes are just as popular in pastry kitchens with French culinary influence. The difference is small but significant—tortes are cakes with little or no flour. They acquire their bodies from ground nuts and plenty more eggs. Some tortes may have a small amount of flour to thicken the batter, some have dry bread crumbs. Tortes use 2 to 4 times the number of eggs that most cake recipes call for. Both cakes and tortes receive high esteem on dining tables, and when it comes to a celebration or a festive occasion, one or the other is unquestionably the choice as the last course in our dining rooms. The selection may be as simple as a home-baked cake from a mix, or a basic inscribed supermarket cake in technicolor or elaborate, exquisite torte from a high-end pastry shop.

The name *torte* has been misused by fashionable menu writers to enhance the image of a simple cake. Torte connotes something rich, European and elegant. Now airline meal menu may denote "torte" as one item on your crammed tray of food for the small piece of simple, unpretentious white cake topped with a strawberry-flavored sugar syrup.

The high reputation of tortes is well-deserved. Not because cakes cannot be equally sumptuous and elaborate and just as difficult to produce. Yet, a humble home baker can bake a simple, easy, almost foolproof cake, but any true torte takes meticulous care, some knowledge and baking experience before you can serve it with pride. And they are anything but foolproof. Tortes don't have a flour matrix to give them strength, and are particularly sensitive to collapse if you dare to disturb them before fully set in the oven. They rely entirely on solidified egg white foam structure for support, which is considerably weaker than a combination of flour and egg white. There is no starch that gelatinizes on heat to give the body extra strength.

Perfect cakes and tortes are light and tender, with moist body, just the opposite of good yeast bread where the goal is a chewy and firm texture with strength provided by the gluten structure. The trick to a light cake is not allowing the gluten to develop, the arch enemy of all sweet baked products. Since tortes have no flour, gluten problems don't exist. Cakes do have flour but you can do

two things to reduce the chances for gluten development:

1. Use cake flour which has minimal protein (that produces gluten),
2. Stir the batter as little as possible to discourage gluten formation. The high fat in cakes is helpful—fat coats flour particles and insulates them from moisture. Without moisture, gluten cannot develop.

Planning ahead

Before you start the baking project, decide if you want a layer cake and if so, how many layers. You can have a two, three or many layers. The authentic, glorious Hungarian *dobos torta* has seven bread-slice thin layers. There are two ways to make layers. Either divide the cake batter into as many portions as layers in the cake and bake each in separate pans, or bake the cake in a single pan and cut the cooled cake with a serrated knife into layers. There is a difference. If you bake in a single pan, the cake bakes longer and you have more chance of a collapsing catastrophe. But with a serrated knife you can cut even, flat-topped layers. In single pans you are safer when baking, but you may need to trim off the domed tops for even layers, and the cake tends to dry out more in the shallow pans. For 2 or 3-layered cake, the choice is yours. For a 7-layered cake you need seven cake pans—it is very difficult to cut a single cake into seven thin, equal layers.

Have sets of good-quality, heavy pans and torte pans (with removable bottoms), preferably in more than one size. Light, inexpensive aluminum pans will not help for even baking.

You can grease the pan either with solid fat (butter, vegetable shortening) or, for convenience, with oil spray, both produce identical results. Dust the greased surface with flour and shake off excess to assure that the cake will release easily. For additional insurance, cut a round of waxed or parchment paper to fit the bottom. Fit the paper into the pan after greasing and flouring both the pans and the paper's surface in contact with the cake. You will have virtually no chance for the dreaded stuck-to-the-pan cake.

And here is another professional trick that is an extra step for you but helps baking professional-looking and high quality cakes and tortes. The sides of cakes and tortes brown faster than the rest because they are in direct contact with the hot metal. Home bakers generally leave the over-browned layer on the cake and cover it with frosting. If too brown, they may trim it off. Many professional bakers, on the other hand, want to avoid too much browning. They wet a kitchen towel, fold it until it is a long, thin narrow strip and tie it around the cake pan. The moisture in the towel slowly evaporates in the oven, cooling the metal just enough to reduce over-browning. An extra step but it is worth it.

Don't let them collapse

When a cake bakes in a cake pan, the temperature is the highest where the batter contacts the hot metal surface. Solid structure first forms along the sides and bottom, then the top begins to color, while the cooler center is still a moist batter. Such a cake may look done, yet the center portion is still at the critical pre-gelatinization temperature (see Baking section above). Many an overeager cook has watched the center sink a minute after the cake is out of the oven, producing a bowl-shaped rather than a dome-shaped art work. There is nothing you can do to remedy this situation—you cannot rebuild the structure—perhaps you can convert the cake into an edible fruit bowl. Or you can salvage the outside part and serve it in chunks covered with a sweet sauce. To avoid such baking catastrophe, touch the center ever so gently with finger near the end of the baking

stage. If it springs back, the center is done, the cake is baked. Another useful sign is when the side shrinks back from the pan as it is beginning to dry out.

If you really must open the oven door at a critical stage, do it very gently to avoid the slightest jarring. Whatever you do, don't touch the cake until it is close to being fully set. Even heavy steps on a bouncy kitchen floor can disrupt the process. Cancel any dance steps practice session in the kitchen while the cake is in the oven. Coffee cakes, which are baking powder leavened and contain less egg, don't collapse as easily. They don't rely on egg white foam structure but on the starch in the flour, giving a framework less sensitive to shaking. Also, they have a high amount of flour relative to moist ingredients, thus a thicker batter giving them more stability before setting in the oven.

Cake and torte recipes generally call for a moderate oven temperature so the batter will expand slowly. Are any of the following symptoms familiar? In too hot an oven the outside surface solidifies into a crust that prevents the cake to expand any more. In too cool an oven the cake expands but no crust forms, and the entire cake dries out too much—a good reason to have an accurate oven before you endeavor to bake the perfect cake.

Cake mixes

Cake mixes are nothing more than the combination of ingredients that you always have on hand and can mix together in two minutes flat—flour, salt, baking powder (or baking soda), sugar, dehydrated hydrogenated vegetable shortening (you would use real shortening), possibly powdered milk and dehydrated eggs (you would use fresh milk and fresh eggs). Commercial mixes do have other ingredients like emulsifiers, foaming agents and gums that you cannot add yourself as these are only commercially available. An emulsifier is the only one useful—it helps to make high-volume, very tender cakes by preventing the coalescence of bubbles in the fat-liquid emulsion.

Sifting together your own ingredients, emulsifier or not, gives you more satisfaction than using a prepackaged commercial product and it is more economical. And you eliminate a dozen chemicals from your cake that packaged mixes sport to extend their shelf life and prevent clumping. Unless you are really short of time, or totally intimidated by baking (in either case you are not likely to read this section), mix your own.

There are cakes and then there are cakes

There are two basic types of cakes: butter cake and sponge cake. This list does not include simple coffee cakes and high-flour cakes such as the popular carrot cake. Those cakes are related to quick breads much more than to cakes, using similar batter, and will not produce the tender, light, fluffy texture of a low-flour, high-egg cake. An example for a butter cake is a standard chocolate cake, while angel food cake is a good example for the family of sponge cakes. Their methods of preparation are completely different, and so are the precautions you take for best results. Neither butter cake nor sponge cake is particularly difficult to prepare. They are excellent basic cakes to learn to bake. Once you have experience to bake those two types, you can undertake just about any elaborate cakes.

Butter cakes

As the name suggests, in butter cakes the original fat was butter. This is an old name that

stuck even after recipes often changed the fat to vegetable shortening or oil. But butter still gives the best-flavored cake. Chemical leaveners (baking powder, baking soda or both) leaven butter cakes but leavening may get additional help from creamed butter and beaten egg whites.

You can prepare butter cakes four different ways:

1. In the *conventional method* you cream the fat with the sugar (that whips the most air into the emulsion) to promote high volume and a light, fine-grained texture. You add the liquid ingredients to the fat-sugar emulsion in a slow stream during mixing, then gently fold in the dry ingredints. The conventional method produces the best cake, but it also take the most effort.

2. The *muffin method* is fast but results in a cake with lower volume and denser texture, because you don't whip air into the fat—it is still moist but less tender. In this method you combine the liquid ingredients, including liquid fat (melted butter or oil) in one bowl and the dry ingredients in another, then you mix the two to form the batter.

3. The *pastry method* is also fast. You mix solid fat (vegetable shortening or butter) into the flour just like if you were making a pie dough, then you add the rest of the ingredients. Again, volume is low because there is no mixed-in air and the cake is denser, but the minimal mixing keeps the gluten from developing much. Most commercial cake mixes use this method. Instead of solid fat they use dehydrated hydrogenated vegetable shortening plus some oil. These mixes also use emulsifiers and foaming agents that cause air to incorporate and retain during mixing to give a lighter texture and more volume. Home bakers not using those chemicals can never achieve such texture and volume with the pastry method.

4. A compromise that offers both quick preparation and high volume is the *combination method*. Combine liquid fat, egg yolks and dry ingredients. Beat the egg whites and fold them into the mix. This is reasonably fast and produces cakes with a good volume and fine texture.

Sponge cakes

As their name suggests, members of the sponge cake family are light as sponge, and sometimes just as dry—there is no fat to lubricate the bites—these cakes rely on egg whites to leaven the batter. Sponge, angel, chiffon and the French *génoise* cakes are included in this category. They serve as foundation and become cakes only with sauces, fillings or frosting. They are like baked potatoes—just OK by themselves but far better when you add something rich on top. What is the difference between them?

Sponge cake is a simple basic cake in which you fold separated whipped egg whites into the the ingredients, including the yolks. The French *génoise* cake is similar except for two things: you don't separate the eggs and you warm the combined whole eggs and sugar to about 100°F (40°C) while beating continuously. The warming part is not essential—you can make a génoise cake without heating but the warming produces a better result.

Angel food cake is a sponge cake without egg yolk. It is even drier than sponge cake because at least yolks add some fat and richness. Angel food cake is too dry to eat by itself.

Chiffon cake is somewhere between a butter cake and a sponge cake. It relies on egg white for leavening, so it is closer to a sponge cake, but it has oil in the batter for moistness. Naturally bland, you can jazz it up with spices in the batter or a tasty frosting you add after baking.

Toasted Hazelnut Torte

This is a wonderful and reasonably easy torte to make. It takes three steps: bake the torte part, make the icing and fill and frost the torte. Instead of hazelnut, you can substitute toasted almonds or walnuts for equally wonderful but very different taste sensation.

Ingredients

7 eggs at room temperature
½ cup sugar
1¼ cups hazelnuts, toasted, then ground fine
½ cup dry bread crumbs

Procedure

1. Separate eggs. Beat egg yolks and sugar with a wooden spoon or electric mixer for a minute until they turn lemon colored. Add nuts and bread crumbs, and mix well.

2. Grease and flour two 8-inch (20-cm) cake or torte pans, line bottom with greased parchment or waxed paper. Grease top of paper.

3. Beat egg whites until soft-peak stage. Stir about a quarter of the egg white foam into the batter to lighten consistency (you may need to add a little milk as well if too thick). Gently fold in the rest of the foam.

4. Divide batter into two cake pans. Bake at 375°F (200°C) for 35 to 40 minutes until firm but not dry. Check tortes very gently by touching top after 35 minutes without shaking the oven or pans. If they feel firm and spring back and sides begin to pull away from cake pans, the tortes are done. Cool for 15 minutes then remove from pans. Strip off paper and cool completely on wire racks. Trim off any burnt parts and trim top flat if domed.

5. Place one torte layer on serving plate, spread with little less than half the frosting. Cover with second torte layer and spread a very thin layer of frosting over top and sides. Chill 15 minutes. Spread remaining frosting over sides and top. Decorate torte as you wish or simply add hazelnut halves around rim on top. Chill for several hours before serving.

Serves 9-10. Keeps well for a week in refrigerator. Develops its flavor best after two days.

Hazelnut frosting

7 ounces (200 g) butter, at room temperature
¼ cup icing sugar
1½ tablespoons rum or brandy
3 eggs
½ cup sugar
¾ cup hazelnuts, toasted, then ground fine

Procedure

1. Cream butter and icing sugar until fluffy, about 2 minutes. Add rum or brandy.

2. Beat eggs with sugar in top half of a double boiler, place it over steam on bottom half. Beat continuously until mixture thickens to the consistency of honey, about 5 minutes. Remove from heat and allow to cool.

3. Blend the two mixes and stir in hazelnut. Stir until uniform. Use frosting when cooled to room temperature.

Enough icing for one 8-inch (20-cm) torte.

What goes on top

You can use sauces, creams and frostings (icings) to dress up your baking efforts or help disguise near-disasters. Choose something that complements your cake. You don't need to follow recipe suggestions. For a moist, fairly rich coffee cake, sauce or frosting is not really needed, but a thick dripping sauce in a contrasting color makes the cake more professional looking, more glamorous, more appetizing and more flavorful. You can even nap the plate with a dripping sauce like classy chefs do, and top each serving with a contrasting color of dripping sauce, just as in crêpes.

For the neutral butter and sponge cakes, you can use virtually any type of frosting. Ice only after the cake is at room temperature to prevent melting the frosting. Generally count on little less than half of the frosting for the layers and the rest for the top and the sides. If you want to make the effort, an exceptional cake or torte has a different filling between layers and a different complementary frosting on top. This is easy for pastry bakeries where they have many different kinds of frostings and fillings in the refrigerater at any one time, but in our home kitchens we have to make each small batch individually. For special occasions it is worth the effort.

Always use icing sugar for the frosting. In the frosting ingredients there is not enough moisture, and granulated sugar doesn't dissolve during creaming with butter—you end up with a grainy, sandy texture. For cooked frostings, however, where sugar is part of the cooking process and there is enough liquid, you can use granulated sugar.

For convenience to apply the frosting, set the cake on a serving plate, then the plate on a lazy susan rotating the turntable slowly while spreading frosting on the sides and top. Some bakers hold the cake plate on their palm to spread frosting on the side, then set it on a lazy susan for top frosting. A good experts' trick is to start off with spreading a thinnest layer first, then chill the cake. This thin layer absorbs crumbs, evens rough surfaces and, once chilled, gives a solid foundation for the rest of the frosting.

Meringues

Meringues and pie crusts have one thing in common. Both are simple once you master the technique and you remember a few points in preparation. But many, even experienced bakers, have problems with both. Making meringue is, indeed, very simple. Whip the egg whites and sugar, spread it on top, bake it and you have a nice meringue. At what stage you stop whipping the egg whites is crucial (see Foam from Egg Whites, above).

Even with the correctly whipped foam, many home bakers have problem after baking—their meringue either weeps on the bottom (moisture leeks out) or beads on the top (little bead-like drops pop up over the surface). Weeping is the result of underbaking the meringue—moisture left in the foam after baking leaks out on standing. If the base under the foam was cold, that may have prevented the foam to fully cook on the bottom. To prevent it, have the base warm or hot before spreading the egg foam. Sprinkling the top surface of the filling with a dry cake, graham cracker, or even bread crumbs also helps. The crumbs absorb excess moisture.

The cause of beading is the opposite—overbaking. Too much heat and the egg white proteins tighten and (on the molecular scale) squeeze all moisture out. The result: dry meringue and moist beading. Avoid the problem by baking at the correct temperature and just until slightly brown.

Some books on baking warn you not to attempt meringues on a humid day. Why? Meringues are high in sugar and sugar absorbs moisture from the air. When the air is humid, they absorb more moisture and the egg foam becomes too wet. There is no good solution to avoid the problem.

Cookies and Bars

Of all the dessert items, cookies and bars (or squares, depending on the shape you cut them into) are the most popular with home cooks. The reasons, first, they have the widest latitude for error of all baked sweets, so they turn out fine even with mistakes, and second, they are the most popular everyday dessert with the exception of ice cream. Easy or not, in some kitchens these end up barely edible. Carelessness, inattention, inexperience, poor-quality ingredients or incorrect oven temperature can all result in a cookie or bar that is hard to serve without apologies.

The most common cookies and bars, like chocolate chip cookies and brownies, are high in sugar and fat but low in moisture and eggs. You need little or no leavening since a chewy but soft consistency or crispness are your goals.

Ingredients

The basic ingredients for both cookies and bars are simple: flour, fat, sugar, eggs and salt. The liquid is often milk. What makes each type different is the added flavoring and the way you shape and finish them.

As with all desserts containing flour, you don't want to develop the gluten in cookie dough. Soft, low-protein flours are best for cookies. For commercial production flours are specifically blended for cookie dough. These blends are not available for the home cook, but a cookie that is home baked with TLC and all-purpose flour beats a commercial cookie made with a special flour blend anytime.

Sugar is an essential part for successful cookies. It increases tenderness, is responsible for the crust color (as it caramelizes in the oven), extends freshness (by holding on to moisture), it robs moisture from flour (so no gluten can form) and it gives that nice and desirable sweet taste. If you prefer cookies less sweet, you can reduce the sugar by 10 to 15 percent without sacrificing quality. If it still tastes too sweet, try experimenting with even less sugar, until the drop in quality outweighs the drop in sweetness.

Because the moisture in the dough is low, starch in the flour cannot change fully into gelatin during baking (it needs moisture).The agreeably chewy quality of cookies is the result of this partial gelatinization of the starch.

Fats are also essential ingredients. Originally lard was the fat of choice in cookies, but today's preferences are vegetable shortening, margarine and butter, less often oil. Butter is by far the best for flavor, tenderness and a melt-in-the-mouth perception, vegetable shortening is the next best if you must avoid butter. Margarine gives you the same results as vegetable shortening (they are both hydrogenated vegetable oils in different forms). If you prefer to use less butter but still want the flavor, try half butter and half vegetable shortening (or margarine). If you decide to reduce the total fat in cookies and bars, you also reduce quality. Food scientists have been busy with some success to come up with lower or no-fat cookies and bars but retaining gustatory satisfaction.

In "health" cookies there is drastically reduced fat while fruit juice takes the place of sugar—they are more like sweetened unleavened bread than real cookies. Good for your health but

not for your enjoyment. With little fat and no sugar the gluten develops and the cookies become dry as the desert.

Eggs add color, richness, structure, nutrients and a subtle flavor of their own to both cookies and bars. The yolks' emulsifying power tenderizes, binds the dough and acts as a leavener.

Salt, at least in a small amount, is essential. To the western palate, no salt leaves any food flat-tasting, no matter what other flavorings you mix in.

Leavening agents, most commonly baking powder, give extra lightness. Most bar recipes and many cookie recipes include leaveners. If the recipe calls for no leavener, the air caught in the dough during mixing expands in the oven that gives a slight leavening effect.

Commercially packaged and bakery cookies contain additional ingredients, termed *surfactants.* These are organic chemicals with interesting names like crumb softener, emulsifier, anti-staling agent and dough conditioner. When you read the label on the cookie package, here is what you usually see: lecithin, mono- and diglycerides, diacetyl tartaric acid esters of fatty acids, polysorbate 60, sodium stearoyl 2-lactylate and so on. Sounds like an organic chemistry lesson. Each of these modifies the final product differently, so which ones they choose and in what proportion depend on the purpose. They can modify dough consistency, reduce stickiness and greasiness, or extend shelf life. Antioxidants reduce off-flavors and allow longer shelf-life. All these additions probably benefit the food processors and commercial bakeries much more than they benefit the consumer.

Mixing it up

There are two basic methods to make the dough:

1. Creaming. You cream butter or other fat with the sugar, salt and spices, then add eggs and other liquids. Finally, you mix in the sifted dry ingredients. Creaming the fat has a different purpose here than in cake batters. Here it is just a way of mixing the ingredients, and you need not be as careful or thorough. Although air in the dough is desirable to lighten the product, it is not as essential as in cakes.

2. One-stage. In this method you put all ingredients into one bowl and mix slowly together. While this is a quick method, it produces denser, drier cookies and bars. Usually the more work that goes into baking, the better the result. Try the two different methods to make the same cookie when you are ambitious on a rainy Sunday afternoon and taste the difference for yourself.

Don't overwork your dough and give the gluten a chance to develop. Minimal mixing ensures that, but lots of sugar and fat also help. The sugar soaks up moisture before the protein in the flour have access to it. Without moisture, gluten cannot develop. The high fat content also hinders gluten formation by coating the flour protein particles and insulating them from the liquid. Nevertheless, overworking the dough jeopardizes the final quality.

If you use a mixer or food processor to combine the dough, make it quick and stop as soon as you see all the dry ingredients incorporated. Undermixing is better than overmixing. These doughs are so simple that hand mixing, having better control, is just as fast.

Bars and Squares

Bars or squares are the easiest to produce and most difficult to spoil. Mix up a batter, pour it into a greased pan and put it in the oven. Not much can go wrong.

The most common error is wrong baking time—too short or too long. It is not easy to judge

when a pan of dough is baked to just the right degree of doneness. If you remove it too soon, it remains doughy in the center and tastes raw. If you leave it in too long, it dries out and loses its moist, chewy quality. Using your own tested recipe with your notes on baking time is helpful, but you still need to test with a skewer or a thin-bladed knife for doneness. Start testing a few minutes before the given baking time, something that can vary a great deal depending on your oven, the size of your eggs, dryness of the flour or the humidity of your kitchen. Even when making your same tested recipe a month later those great fig bars may not turn out as good.

How you cut up the finished result makes them squares or bars. There is no reason why they cannot be diamonds or triangles.

Cookies

The word *cookie* came from the Dutch *koekje*, meaning little cakes. Cookies come in an endless variety, calling for all sorts of different and unusual doughs.

It takes considerably more effort to make cookies than bars—they must be formed and plopped individually on a cookie sheet. That is time consuming, particularly when you are baking 6 or 8 dozens. Because they have such tiny volume, it is very easy to overbake or underbake cookies. Sometimes they spread out on your cookie sheet and bake into a flat, cow-pie-looking object instead of many neat, plump, individual cookies. At other times, they end up hard as forgotten week-old dinner rolls with burned bottoms and edges, and a bitter flavor. Do these sound familiar? Still and all, cookies or bars are your best bet when the occasion calls for a quick-fix dessert.

All baked cookies have a low moisture content of less than 5 percent, and very crisp cookies only contain 2 to 3 percent. It is the low moisture that keeps cookies from spoiling. There is not enough moisture left for organisms that could feed on them. The cookies eventually get stale, but you have never seen one that spoils from bacteria or mold.

Types of cookies

According to the method you make them, cookies may be the following types:

1. *Rolled cookies* are made from a chilled dough that is very low in moisture. Roll out the dough thin as you can, cut the cookies with a cookie cutter and place them on a baking sheet ready to bake. You can decorate them either before or after baking. Rolled cookies are time-consuming to make at home but commercially machines make them by the millions in minutes. An example for rolled cookie is the traditional holiday cookie.

2. *Drop cookies* are faster to make than rolled cookies. The dough has more moisture to allow you to drop the dough by the spoonfuls onto a baking sheet. If you are making a lot of drop cookies at one time, fill a pastry bag with a fairly soft dough. With the pastry bag you can produce them faster with neat, uniform size and pretty shape. If your dough contains coarse nuts, fruit pieces or chocolate chips, you need to use a pastry tube with a large opening or the coarse pieces plug it up. An alternative to pastry tube is tiny professional scoops, like a miniature ice cream scoop, with a spring-return spoon scraper, available in restaurant supply houses. They are also reasonably fast, easy to clean up. A set of different sizes in your drawer is an excellent addition to your kitchen tools.

3. *Refrigerator (or icebox) cookie* dough is a little drier than drop cookie dough. After mixing, you roll the dough into a cylindrical shape size of a thick summer sausage, wrap and chill it for several hours until quite firm. If you have French baguette pans, their trough shapes are perfect

to chill the dough in. (While the dough is still warm, it tends to spread a little on a flat baking sheet.) Without baguette pans check the dough after 15 minutes of chilling and re-shape it to a nice round cylinder if it has flattened a little.

The cold dough is easy to slice into thin cookies with a thin-bladed very sharp knife that you place directly on a baking sheet. These cookies are quick and easy to make, but remember to schedule time to chill the dough (an hour or two). The dough keeps well in the refrigerator for many days and freezes well for future use. Refrigerator cookie dough is handy to have—they take little space and ready to bake faster than your oven preheats.

What happens in the oven

Here is what happens to cookies in the oven, in three short acts:

1. In the first phase the dough starts to expand from the heat, and the moisture evaporates increasingly faster.

2. In the second phase the dough becomes hotter, continues to expand and lose more moisture. Color begins to develop through complex chemical reactions (both browning reaction and caramelization).

3. The final phase is short. There is little moisture left, the dough starts to thin and color develops quickly.

There is an additional phase that follows quickly after #3 if you forget to set your timer. The color turns from brown to black, heavy smoke develops and charcoal begins to form. Smoke alarms go off.

During baking sugar and fat melt from the heat in the dough, the sugar dissolves, starch and proteins swell and a structure begins to set in. If the dough is rich in sugar and fat, there is not enough moisture for the proteins to set and the starch to gelatinize completely. This has two consequences: the structure is not very rigid, so as the cookies cool, they partially collapse and develop the familiar pretty cracks on top. This is desirable in many cookies because it makes them chewy and attractive.

The second consequence, longer shelf life, doesn't matter as much for home-baked cookies. If they are good, they will disappear without lengthy storage.

Perhaps the most problems home bakers experience with cookies is too much spread while baking. Instead of the neat, little, compact thing that you find in commercial packages, you may get a flat cookie with thickness of a penny but size of your palm. Or, even worse thing happened to me, as all the neatly-shaped cookies on the cookies sheet spread into each other, producing one giant, flat cookie the size and shape of your baking sheet. Why, and how do you remedy it?

Cookies spread for several reasons. If your fat is butter, your dough tends to spread more than if your fat is vegetable shortening. Butter melts over a narrow range but not shortening. If butter melts before the dough structure had a chance to set up, your cookies end up flat and thin. But if the structure sets up before the butter had a chance to melt, you win and you get neat, compact, thick cookies. The solution? Keep the cookie dough chilled before it goes in the oven, so the butter needs longer to melt. Chill it in the refrigerator, cookie sheet and all, and pop it in the preheated oven straight from the refrigerator.

Another solution is to use vegetable shortening as fat but than you lose the wonderful buttery taste, and the flavor is closer to a commercial packaged cookie. Try a compromise: use half butter, half vegetable shortening. If you prefer the full buttery flavor, chill the dough.

Cookie tips from the pros

How can you make consistently good cookies and bars? Here are some suggestions.

- Make your cookies small. The giant cookies sold in malls by bakeries and cookie companies are made large mainly to save on labor. Cookie-making is time consuming. Small cookies are easier to eat, look prettier and show that they are home-made and shaped with care, a definite plus in this day and age of store-bought everything.
- If you have a standard oven, make cookies one large sheet at a time. Cookies are very sensitive to variations in oven temperature, and with two or more sheets in the oven at different heights, cookies on different sheets will bake to a different crispness, some a little burned, some underdone. Since most cookies take only about 10 minutes in the oven, baking one sheet at a time does not add substantially to the length of your baking project.
- In a convection oven the temperature is relatively uniform throughout, and you can successfully bake several sheets of cookies on different racks in the same time. Watch your cookies closely because convection ovens also have some temperature variations, particularly if you restrict air circulation by large cookie sheets.
- Make several batches of cookies while you are at it, and store some for future use. You can freeze them either baked or unbaked. It is simple to defrost the already baked cookies, then refresh them in an oven for 3 or 4 minutes, set at the same temperature they were originally baked at. You will not be able to tell the difference between these and truly fresh-baked cookies. To freeze, shaped raw drop cookies, put the mounds close together on a cookie sheet and set the sheet in the freezer for half an hour. (Set your timer so you won't forget.) Then take the frozen dough off the sheet, label and include baking directions and store them in a heavy plastic bag in the freezer. They will stay as individual pieces. When you need them, place them on a cookie sheet about two fingers apart, let them warm up for about 15 minutes and bake as usual.
- Remove baked cookies within a couple of minutes from the cookie sheet, or they may stick to the sheet as they cool. Many cookies are too soft and tender to remove at once while hot without breaking, but in a couple of minutes they harden (set your timer), then finish cooling on a wire rack. If you forget to remove baked cookies immediately and they stick, put the sheet back in the hot oven just long enough to heat them up. The cookies should come off easier.
- Greasing cookie sheets is not necessary unless the dough is low in fat. In fact, the cookie dough has a tendency to spread too much during baking if you heavily greased the baking sheet. Greasing is necessary for squares because the depth of the pan makes it hard to remove the pieces even if they are only slightly stuck.
- Wait until a pan of bars cools before cutting and removing them from the pan but as soon as they are out of the oven, score them skin-deep, then finish cutting up when cool. This extra step helps for neater cuts because the scoring cuts thrugh the top layer that dries out on cooling and makes neat cuts difficult.
- Cookie dough may spread out thin and flat if the oven temperature is too low. If your cookies turn out dry and pale with burnt bottoms, the oven temperature may be too high.

Pies, Tarts, Cobblers

Pies are the third most popular American desserts following ice creams and cookies. Considering the amount of work you put in, you get more mileage out of pies than from any other dessert, considering both taste and eye appeal. Attain the experience to make a good pie dough quickly, and you have the basis for making a very good dessert for any occasion. Most fillings, whether simple or elaborate, are reasonably easy to make, even with meringue, whipped cream or any other topping. You can even prepare the dough (or baked crust) days in advance and finish it in no time on the day you plan to serve it fresh from the oven.

If you use a good recipe and good ingredients, preparing a delicious pie or tart has only one secret: you must make your own crust. Commercial food processors learned how to make quite acceptable cake mixes, frozen cakes and a number of other frozen pastries, but they haven't managed to produce a good fresh or frozen pie dough or crust.

If pie crust is not yet on your list of skills, take a few hours and learn how to do it. The ingredients are inexpensive, even if you have to throw a dozen doughs or crusts out before your thirteenth attempt is a winner. Once you master the technique, making your own crust is a snap.

A simple way to learn is to watch someone who is good with pie dough. Or learn it by yourself from books or videos. It helps to understand what happens in the dough so don't skip this section.

What goes into it?

Pie dough has only four ingredients: flour, salt, fat and water. Tart pastry has the same four ingredients plus sugar and maybe egg.

Commercial bakers use pastry flour specifically made for pies. Like cake flour, they mill it from low-protein and high-starch soft wheat to promote tenderness. Pastry flour is not as finely milled as cake flour. Don't try to use cake flour for pie dough. It is too fine-grained, and tends to paste up when you add liquid. Specialized pastry flour is not available to most home cooks, but you can mix cake flour with bread flour in a 7:3 ratio and come close to commercial pastry flour. But that is hardly necessary—all-purpose flour is quite suitable, too, and you always have it on your shelf.

Salt is an essential ingredient and does not vary in amount, without salt the crust tastes flat. Use ¼ teaspoon salt for every cup of flour.

The amount of water you need, however, varies with the humidity, your climate and the amount of moisture in your flour and fat. Recipes give an approximate amount, but start with smaller than called for, and add more little at a time to arrive at the correct, easily workable dough consistency.

Fat is also a variable. What fat you choose and how much you use makes a huge difference in the consistency, texture, flakiness and flavor of your pie crust.

The role of fat in the dough

The fat's ability to interfere with the formation of gluten is called its *shortening power*. What happens is that the fat coats the protein grains in the flour and keep them from absorbing moisture. Without moisture the proteins cannot convert into gluten, that elastic sheet-like substance so essential for good breads but a killer in pie dough. Lard, vegetable shortening and oil have high shortening power. Butter and margarine have less because they are not all fat—they contain about 16 percent water (while other fats have none).

Lard not only has high shortening power but also just the right physical properties (called *plasticity* and *dispersability* by food scientists) to produce the most flaky pastries. But you cannot use just any kind of lard. Which part of the pig it comes from, or even from which part of a single layer it is taken, determines the type. The ideal lard for pies is leaf lard, a layered fat located around the pig's kidneys. It has a crystalline structure that readily forms tiny layers in the pastry, resulting in flakiness that a top pastry chef can be proud of.

When bakers, both commercial and at home used lard extensively for biscuits and pastries in the past, leaf lard was readily available. Concerns about fats and cholesterol in modern times has changed all that, and these days you would be hard put to get leaf lard even from a good butcher. Slaughterhouses no longer separate fats from various parts of the pig; there is not enough demand for leaf lard. The lard that is available in retail markets is a rendered fat that may be from any part of the animal. It is a refined, emulsified, hydrogenated all-purpose product meant mostly for frying. Though not ideal, this lard still makes good flaky pastry.

TASTINGS Lower-fat pie crust

The total fat in a pie crust ranges from 30 to 35 percent. Tart pastry is richer with 35 to 40 percent. For a single-crust pie with seven average servings, this translates to 1¾ tablespoons fat per serving; a double crust pie contains nearly twice as much fat. If this concerns you, you can reduce the fat in your dough to 25 percent without very much affecting flavor and flakiness. Using 2½ ounces (70 g) of fat for every cup of flour gives you about 25 percent. You can also use a smaller amount of dough that you roll out very thin so there's less dough per serving. On the other hand, if you make a good crust, it is very much an essential part of the total flavor, and you don't want to skimp on it.

You can choose butter, margarine, vegetable shortening, oil or a combination of any two, instead of using straight lard. Which one you choose depends on your personal health concerns, your budget and your taste preference. To choose the best for yourself, I recommend you experiment one nice day when you feel like undertaking an hour's worth of dough preparation. Make a number of pie doughs with different fats and different combinations of fats, bake them identically in little tart pans and let your taste buds decide the winner. It is not only the flavor that counts. You also need to judge the texture and flakiness.

Lard makes very flaky, truly melt-in-the-mouth crusts. Pure butter makes mealier, not-so-flaky crusts that have a wonderful buttery flavor. For French-style tart pastry the traditional fat is butter. In spite of the French tradition of butter or nothing, pure butter doesn't make the best crust for most American palates. Vegetable shortening and margarine crusts are fairly flaky without much flavor. An oil crust is tender but crumbly, not a true pie crust. Most American palates prefer half lard and half butter or half vegetable shortening and half butter. Both of these combinations produce flaky crusts with a pleasant, buttery flavor.

Other points to observe

The water you add to the dough must be cold. If your tap water is really cold, use it. If not, use refrigerated or iced water. Why is that so important? Cold water keeps the fat from softening. As long as the fat remains hard, the fat particles will stay discrete and not clump together or homogenize. The more discrete they are, the flakier the pastry will be. That is why you also chill the

dough before rolling it out. Unchilled dough is sticky and requires more flour when you roll it and more flour means a tougher crust. The less time you work the dough, the cooler it remains, so fast work is mandatory for a flaky crust.

Any dough, especially pie dough, needs to rest after mixing. The resting period allows any gluten that may have developed to relax, which makes it easier to work the dough in subsequent steps. For the very best crust, let the dough relax again in the refrigerator after rolling it out and fitting it into the pie plate. This step also helps to minimize shrinkage. Pie pastry should be as cold as possible when you put it in the oven, in fact it is best never to let pie crust warm up. The only time you let it warm up slightly is just before rolling. At normal room temperature chilled dough warms up enough in 10 to 20 minutes to make working it easy. The ideal rolling temperature is 50°F (10°C)—if you are a purist, you may want to check your dough with a thermometer.

An optional pie dough ingredient that housewives in the distant past never forgot, (even if they didn't know what it was for) is a little vinegar. Now we know why they used it. Making the dough slightly acid helps the gluten relax, which in turn makes working the dough easier. Acid also breaks up any of the long gluten sheets that may form. Vinegar, lemon juice or cream of tartar all do the same thing. If you use the first two, add them to the chilled water. If you use cream of tartar (¼ teaspoon for a single crust), sift it with the flour. For a single-crust pie made with 1¼ cups of flour, about half a teaspoon of vinegar or lemon juice is enough to slightly acidify the dough.

As steam develops in the dough during baking, the steam puffs up the flaky layers slightly, that is very desirable as it gives some airiness to the crust. If your oven temperature is too low, the heat doesn't generate enough steam, and you may get a perfectly nice flaky but unpleasantly dense, doughy crust.

How to make a pie dough

There are two basic methods of making a pie dough—with hand or in a machine. In my kitchen tests I compared the results made with hand, in a food processor and with a food mixer. The food processor did a respectable job but the food mixer did not. Even with the food processor, you need to finish mixing by hand or you are likely to end up with an unfortunate overworked dough. To make the dough with the processor, follow your manual's instructions only until the ingredients begin to coalesce. Then dump the partly-formed dough on a pastry board and complete the last steps by hand. Whether by machine or hand, the idea is to cut the hard, solid fat into the flour so it remains in discernible pieces. By hand you can do this with two knives working them parallel but in the opposite direction, or a pastry blender that meant for this purpose. Or simply quickly rub the fat into the flour with cold fingers.

A food mixer doesn't mix the dough very well, leaving fairly large chunks of unworked fat in the dough. Longer mixing eventually gives a more homogenous mass but at the cost of overworking and warming the dough that bakes into dense, tough crust.

While we are on mixing, let's distinguish the two types of American pie crusts—the flaky type in which you mix solid fat into the flour until still fairly coarse, around pea size, and the mealy crust in which you mix the fat thoroughly into the flour until very fine. Southerners prefer mealy crust while the rest of the pie-lovers like the flaky type. For mealy crusts you can use food processors to form the crust a little longer—it is still good to finish the last few second by hand.

Some cooks like to use a pastry cloth for rolling out pie dough. There is even a tube-shaped pastry cloth that fits over the rolling pin. A pastry cloth minimizes sticking and the need for additional flour. For experienced bakers it is just an additional gadget to store and clean. Quick

work and correct dough consistency at the right temperature assures problem-free rolling without any help.

Cookbooks tell you to shape the finished dough into a ball before chilling. However, shape yours into a flat disk. First, a disk is thinner, cools faster in the refrigerator. Second, it warm up faster when you are ready to roll it out. And third, a disk is easier to roll into a circle than a ball—with a disk you are already half-way there. Cover the disk with plastic wrap or place it in a plastic bag and put it in the refrigerator for at least one hour to chill and relax.

After the dough had a nice long rest, bring it to about 50°F (10°C) for easy rolling. The secret of a good rolling technique is to work the dough from the center out with deliberate but not vigorous movements. Coax the dough to roll out thin—don't force it. The dough may refuse to obey you if there is not enough flour on the board and it sticks instead of thins out. If that happens, gently lift the dough and sprinkle a fine dusting of flour under it as well as on the rolling pin. This should give you the upper hand. Never gather the dough again and roll it out twice—it toughens the crust. Once you start, you are committed. For the same reason, don't work too much of the trimmings from the first pie crust into a second crust or a top crust. Make "orts" out of them, instead, by sprinkling each leftover piece with cinnamon and sugar, or cocoa and sugar, and spread them on a baking sheet. Put them in the oven with the pie, but remove in 10 minutes or less, depending on their thickness. Orts are great sweet tidbits to nibble on.

To transfer the finished dough circle from the work surface to the pie plate, roll it up on the rolling pin, hold it over the plate and unroll it over the pie plate. Avoid stretching it any more because it causes more shrinkage on baking. If you need to move it to center the dough on the plate, lift and move, don't stretch. The gluten remembers its original shape. If you stretch it, it will spring back in the oven like a rubber band. Another method of transferring the rolled-out dough is to fold it in half and then again into quarter. Lift it onto the pie plate and unfold.

Prebaked crusts

Some recipes call for raw pie dough, other prebaked crust. Occasionally you may come across recipes that start with a parbaked (partially baked) crust. You bake raw pie dough with the filling, while you fill prebaked crusts with filling but no more baking. (Some prebaked, filled crusts may also go back in the oven for more baking.) Parbaked dough is in-between. It is filled then baked. If you have a very juicy filling, you can avoid soggy bottoms by parbaking the crust then finish baking with the filling. Partially baked dough has more resistance against absorbing moisture than raw dough.

When prebaking, also called *bake it blind*, bakers' common problem is with shrinkage of the dough. If you made the dough properly, chilled it well, rolled it with care and use heavy pie weights, shrinkage should be negligible. Here are a few more points to help.

Use heavy pie weights, either ceramic or metal. Beans and rice suggested by many cookbooks are handy and inexpensive but too light (some cooks even use pennies and metal dog collars). Use an aluminum foil to cover the dough then spread the pie weight on the foil. Don't brown the crust too much in baking—too dark crusts (though delicious) become to hard to cut with the fork and they are unkind to your guests.

An interesting variation of baking crust blind is to bake it upside down. You need two identical pie plates. Roll out the pie dough to size, trim it and place it in the pie plate. Cover it with a wax paper, then place the second identical pie plate over the wax paper and bake the assembly upside down. Halfway through baking remove the top pie plate and return the bottom plate with the

partially-baked dough in the oven until the crust turns light browned. Remove the pie plate and crust from the oven, cover the crust with the pie plate you'd had on top, turn all upside down and now remove the second, inner pie plate and wax paper. If the inside of the crust appears slightly soggy, or not quite brown, return it to the oven for a few minutes.

One problem with the upside down method is that you cannot make a decorative edging pretty—the second pie plate tends to crush your artwork. But shrinkage with this method is very little.

What to put inside the crust

We have four kinds of pie fillings:

1. *Fruit pies* ideally have fresh fruits. If that is not available you can substitute canned, frozen or dried fruit. Don't bother with prepared pie fillings if you are a serious bakers. Make your own. An example for fruits pies is the all-time American favorite, the apple pie.

2. *Cream pies* you make with smooth, creamy, pudding-like mixtures using milk, eggs, thickeners and flavorings. Cream pie fillings always go into a prebaked pie shell, and often they receive a cover of whipped cream or meringue. One of our favorite in this group is lemon meringue pie.

3. *Chiffon pies* are either fruit or cream pies, but you fold sweetened meringue into the hot filling before pouring it into a prebaked pie shell. Banana chiffon pie is in this class.

4. Specialty pies include everything else, from pumpkin and squash to pecan and Boston cream pie.

Thickening with starches

We use starches to thicken sauces, gravies, soups and pie fillings.. The traditional thickener for American cooks and bakers is flour. This choice was unfortunate for pie fillings because there are several other starches with characteristics more suitable for them. When thickened with flour, for example, the pie filling is cloudy and unappealing. With cornstarch it becomes brightly translucent and with tapioca starch brilliantly transparent in which color and individual luscious pieces of fruit show through clearly.

There is also a difference in flavor that various starches impart. Flour gives a slightly pasty flavor but cornstarch and tapioca are flavorless, or nearly so. Some starches break down in the freezer, others are unaffected. This property is important in commercial preparations but also for the home bakers who freeze pies.

Flour has half as much thickening power than other starches (flour has much less starch content than starches). Remember that when you substitute another starch for flour—use half as much or you will have a thick, stubborn goo in your pie, not a filling.

Though it may seem that starches have indefinite shelf-life (nothing can spoil in them), food scientist showed that they lose some of their thickening power when exposed for a longer time to the oxygen in the air. Store them in airtight container and don't buy more than you can use in a year or so.

The following table gives you a comparison of the various common starches available to us. Arrowroot and tapioca are available in any Asian market, tapioca in any supermarket. (If you only see pearl tapioca on the shelf, make a tapioca starch by pulverizing it in a food processor or in a mortar.) Different kinds of flours are also included in the table for comparison purposes when using

them in sauces, gravies and soup. Try to avoid them in pie fillings.

Comparing Starch Thickeners

Starch	**Coloring**	**How viscous on a scale of 1-3 (1 thinnest)**	**Flavor**	**Appearance**
All-purpose flour	Brown-gray	1	Pasty	Nearly opaque
Cake flour*	Off-white	1	Pasty	Nearly opaque
Bread flour	Gray-white	1	Pasty	Nearly opaque
Rice flour	Brown-gray	2	Slightly pasty, bitter	Nearly opaque
Arrowroot	Off-white	2	Flavorless	Pearly, translucent
Cornstarch	Off-white	1	Nearly flavorless	Translucent
Tapioca	Light gray	3	Flavorless	Nearly transparent

* Cake flour gives the smoothest, whitest sauce of all the three wheat flours

Finishing touches

Both the type of filling and old tradition dictate whether to use a single crust, double crust, or a lattice top on a single crust. Different pies are more attractive or more practical with one or another type. The choice is often yours. Do you, your family or guests like pie crust? Use double crust. Are they concerned with high fat and cholesterol? Use a single crust. Is eye appeal important? Use a lattice top. Whichever you choose, you can put almost anything into a pie or tart pastry.

Creativity starts with the finishing touches. You can do anything with the edges or, if you use double-crust, with the top. Leftover pieces of chilled dough is your starting material for designs of any sort. Stick the finished pieces on the top crust with just a hint of moisture. Just remember, the dough must remain cold. If it starts warming up while you are creating your masterpiece, take a rest and let it cool in the refrigerator for 10 minutes.

Pie wash on the top crust or lattice add beauty and shine. When you brush melted butter, milk, cream, egg wash or egg yolk on the crust, the finished product turns an appealing chestnut color. Sprinkling some granular sugar on top gives the crust an extra sparkle. A fruit glaze is a traditional finish on tarts for a beautiful effect.

The French prefer a close relative of our American pie pastry called *galette* pastry. Its composition is similar to our pie pastry, but they construct it free-form by hand, like pizza dough, and bake it on a baking sheet, not in a pie plate, until crisp. Butter is the traditional fat of galette pastry, and with its high butter content it is difficult to roll it out neatly like a pie dough—that is why the free-form construction.

Tart pastries are higher in total fat, therefore richer than pie pastries and they contain sugar. The fat and sugar inhibit gluten development so tart doughs are not as susceptible to overworking as American pie doughs are. In fact, you can safely reroll them twice if needed without sacrificing

tenderness.

The French version of tart pastry is called *brisée*, and it is so rich that it is nearly impossible to roll out unless you are a pastry chef. It is easier to press the dough into the tart pan with chilled, floured fingers. (How do you chill your fingers? Dip them in ice water.)

You need to bake tart dough longer than pie dough to a very crisp stage before you add the filling. It holds its shape well because of the sugar and fat, and you can comfortably lift it off the baking sheet in one piece after it cooled. It is like a big cookie. The French cuisine uses tart pastries extensively.

Cobblers, Crisps and Crunches

Cobblers and *crisps* are the invention of bakers who never mastered the art of a good pie crust. This class of desserts breaks the rule that the more effort you put into it, the better your creation. These are easy and quick desserts, homey, informal with little work, yet wonderfully satisfying.

Cobblers and crisps are similar to fruit pies with two differences. The crust is not a pie crust, and the dough is on top of the filling. It is like an up-side-down single-crust pie. The difference between cobblers and crisps is small—cobblers are fruit pie fillings with a simple biscuit dough on top (no bottom crust), crisps are similar fruit fillings topped with a mixture of flour, sugar, butter and flavorings but no leavening. Topping for crisps is uncommonly simple—if you haven't yet mastered making good biscuits, crisp is for you.

Not much can go wrong with either cobblers or crisps if you use a good recipe. The only problem that bakers run into is not enough thickener in an unusually juicy fruit with a too-runny result that is difficult to serve neatly. Many flustered cooks resort to serve their creation in bowls accompanied by a spoon. When in doubt, it is always better to use a little too much rather than too little thickener.

Crunches, the third member of this unpretentious family, are a variation on the crisp theme—they are also covered with unleavened dough that includes oatmeal or granola cereal to give them a crunchy texture and flavor.

Brown Bettys are another crisp variation—their toppings include mainly bread crumbs or graham crackers with butter. You may put this mixture on top or layer it with the fruit.

Any of these desserts are great and ready to serve as they come out of the oven, but you may enhanced them topping with cream, ice cream or a dessert sauce. It is best if you plan ahead, if possible, to let them cool somewhat before serving. Most of them may be too runny while still hot, also their flavor improves while they cool to room temperature.

If you are still gaining confidence as the future pastry chef of your kitchen, any of these are excellent choices to start your career. Everyone likes them—they are familiar comfort foods. They are not heavy or rich and when you have limited time to whip up a dessert on a short-time notice, few others can compete with this healthy and satisfying medley. They also keep well when chilled and even improve.

The Mousse Clan

Members of the mousse clan are creamy-sweet, velvet-smooth concoctions that we savor by each spoonful in gastronomic delight. They are pudding-like with no pastry base or topping and no flour other than as thickener. The clan includes the familiar and homey puddings and custards, the

stylish, elegant mousses, the less familiar creams (or *crèmes*), the old-fashioned fools, whips and the culinary *tour-de-force,* sweet soufflés. Although their preparation ranges from simple to difficult, they all satisfy your sweet tooth like nothing else.

Who is who

Puddings and *custards* are based on milk (or cream), eggs and sugar in varying combination as well as flavorings. The thickening agent is egg. Recipes may also call for flour, starch or gelatin to ensure a firmer structure. Although these thickeners are not essential, they reduce the chance of failure in case your eggs turn out scrambled instead of thickener.

There is a subtle difference between custard and pudding. Usually anything thickened with eggs only are called custards, while puddings also contain another thickener. The basic preparation for both is the same and both used to be more popular than they are today. They are easy to prepare, nutritious and inexpensive, and institutions often served them to save on labor. When cheap instant pudding powders appeared on grocery store shelves, they made home preparation remarkably easy. Just stir the powder into water, heat and you have instant dessert. Today bakers still serve them as informal everyday desserts, though less frequently.

Gelatin desserts are also in this category. (See Gelatin in this chapter.)

Creams and *mousses* are closely related and similar to custards and puddings in consistency. Creams (the French call them *crèmes*) are heavy cream and flavorings whipped together without any thickeners. Mousses are whipped cream and flavorings with added gelatin to give a firmer structure. If there are eggs in the mousse, they are not for thickening but for extra flavor. Some recipes fold in beaten egg whites for a cloud-like texture. Mousses today are especially fashionable desserts.

Fools and *whips* are always fruit based desserts. In case of fools (originally a British term of endearment from where the name came), you fold sweetened whipped cream into puréed or finely chopped fruits, while whips use a similarly prepared fruit with sweetened beaten egg whites folded into them, instead of cream. Both are best when cold. Fools are uncooked but whips may be baked before serving. Just as easy to prepare as creams and mousses, they can also be just as impressive and delicious. For some reason they are not nearly as popular as mousses. They are particularly good summer desserts when plenty of fresh, good-flavored fruits are in season, especially berries. Their frosty, refreshing chill is a welcome sight on a hot summer dinner table.

Rhubarb fool

Fools are particularly good when you make them from tart fruits, such as gooseberries or currants but the tart rhubarb (even though it is a vegetable) also well qualifies.You may serve this not only as dessert but to accompany roast or fried chicken or pork, but reduce sugar to ½ cup when you serve it as side dish.

Ingredients

1¼ pounds (570 g) rhubarb, cut into 1 inch dices
¾ cup sugar, divided into 10 and 2 tablespoons
2½ teaspoons tapioca or arrowroot starch, mixed in 2 tablespoons cold water
½ cup heavy cream (not ultra-pasteurized), chilled

2 tablespoons rum or brandy

Procedure

1. Cook rhubarb with 10 tablespoons sugar until beginning to turn tender, 5 to 10 minutes. Add starch-water mixture and continue cooking until rhubarb is very tender about another 5 minutes. Cool to room temperature.

2. Whip ice-cold heavy cream in chilled bowl with chilled beaters to soft peaks, add rum or brandy and remaining 2 tablespoons sugar. Whip for few more seconds.

3. Gently fold whipped cream into rhubarb and divide into four small serving bowls. Chill. Garnish with mint leaves or sweet fruit sauce.

Serves 4. Holds well refrigerated for several days.

Let's not forget the most spectacular member of this family, *dessert soufflés*. They demand far more preparation, attention and expertise than fools or puddings, but the basic ingredients are similar: mostly eggs and flavoring, often with milk and possibly flour or starch. The ingredients and their exact proportions are critical. So is the way you whip the egg whites, and the technique for making the basic sauce, as well as the temperature of the oven and bake time. Presenting a perfect soufflé as a finale to any meal is like serving a piece of art.

You make soufflés in two basic steps. First, you carefully cook and thicken an egg yolk-based custard-like sauce. Add the flavorings after the sauce reaches the right consistency. The second step is to beat the egg whites to a soft-peak stage and fold the foam into the sauce. Pour the mixture into a vertical-sided soufflé mold and bake. Heat expands the beaten egg white, just like in a cake but the soufflé's structure is especially unstable.

Soufflés can easily double, even triple in volume in the oven. Insert a paper collar around the inner edge of the soufflé mold to give support to the baking batter that rises above the edge of the dish. Otherwise you will end up with a giant mushroom shape with a large flat cap. Remove the collar just before serving.

When to remove the finished soufflé from the oven is also crucial. Pull it out a few minutes too soon, and you and your guests can watch your marvelous creation deflate before your very eyes. Leave it in two minutes too long and you end up with something that beginning to taste like a dry omelet thickened with sawdust.

Soufflés don't hold well. You must serve them straight out of the oven, so you must keep the guests on schedule. To serve this masterpiece for maximum effect, place it on the table, cut into pieces and served while everyone is watching. An alternative is to bake soufflé in individual soufflé dishes. Either way, soufflé is best fresh. They don't store well till the next day.

For all the time and effort you put into them, the risk of total disaster is high. Baking soufflés is for brave and experienced cooks but the results are spectacularly rewarding. Prudent cooks have a back-up dessert when baking soufflés.

Tips on cooking with eggs

Most of our discussion and information on eggs are in the chapter Unscrambling Dairy and Eggs. Here I only mention a few points that help with the cooking of custard, pudding and dessert soufflés.

Eggs are the thickening agents in all three. They thicken on heat but if they coagulate

(curdle), you end up with scrambled eggs. Slow heating and continuous stirring prevents eggs to coagulate. Continuous stirring ensures, that in no part of the saucepan's hot surface there is a quick buildup of heat, that could scramble your eggs. Slow heating also helps to start thickening at a lower temperature, around 150°F (66°C) that continues through 170°F (77°C). Fast heating delays thickening until close to or above 170°F (77°C) and leaves too little time for the thickening process. That invites the danger of curdling.

If you want to play it safe, use a double boiler but that takes much longer. However, with both sugar and milk with the eggs, the chance for curdling is small, you are fairly safe. Sugar molecules are large and they tend to interfere with the bonding of the egg molecules (that leads to curdling). The way milk hinders curdling is that it dilutes the eggs and the egg molecules are simply not physically close enough in the solution to easily bond. With slow heating and relentless, slow stirring you are reasonably well-assured to cook flawless custard-like mixtures on direct heat.

You may choose the easy and safe method of baking custard in the oven in a hot water bath (the French *bain marie*). The hot water protects the eggs from coagulating by keeping the temperature no higher than the boiling temperature of water. Under these circumstances your mixture heats slowly, gradually with a assurance that you will not be serving a sweet omelet.

Serving tips

You can prepare any of these desserts either in individual serving dishes or in one larger dish from which you portion out each serving. Small, individual servings are always preferable—they have an air of elegance and personal attention. Either way, it pays to garnish for a dressed-up look and appeal. The garnish may be simple sprigs of mint, tiny edible flowers or leaves, a dollop of whipped cream or something intricate—it doesn't matter. The message is to invite the guests' eyes and entice their taste buds for the anticipated culinary experience.

Serving from a single large serving dish is less attractive for a formal affair. Even when the serving dish is stunningly decorated, once you start portioning out your creation, the effect is quickly lost, and individual pieces are not easy to fashion as prettily as you could present a serving of a pie or a layer cake.

Crêpes

Crêperies are small eating places, common in France but rare in America, where they feature almost nothing else but *crêpes*—both sweet and savory. There are dozens of filling choices in every category, hot and cold, from tart to spicy. The crêpe itself, like bread and tortilla, is neutral in flavor, and anything edible goes as filling as long as it is not too liquidy that would make the plate messy and unattractive. When you prepare crêpes as sweets, a small amount of sugar in the batter gives a pleasing undertone. For savory filling sugar is distracting in crêpes. You may opt for all-purpose crêpes with just a touch of sweetener in the batter, perfect to wrap either a savory or a sweet filling.

You make crêpes from a thin pancake batter with no leavening. (The American pancakes are leavened with baking powder.) A good crêpe must have a pleasant but neutral flavor, should be sufficiently resilient that you can roll it without cracking and resistant against becoming soggy. That is all its requirements. The primary ingredients are flour, milk and egg, the flavorings are salt and sugar. A little added oil helps to avoid sticking during frying.

The perfect crêpe batter

Crêpes are the kinds of desserts that you order when eating out. Few cooks bother to make them in their kitchens, though they are not particularly difficult with the right crêpe pans and just 15 minutes of mastering the technique. There is little consensus among cooks on how to prepare crêpes. Ten different cookbooks offers ten recipe versions for the basic crêpes and ten different preparation techniques. Some recipes call for extra egg yolks, some use a mixture of milk and water for the liquid, some call for milk and light cream, and some use milk only. The fat is melted butter in one, oil or a combination of butter and oil in others. Flour also varies from all-purpose to a blend of cake and bread flours. Some call for additional flavorings, like brandy or cognac, too. Some recipes tell you to separate the eggs and fold the beaten whites into the batter for extra-light crêpes. Finally, the ratio of the three principal ingredients—liquid, eggs and flour—differs considerably.

I decided to test many different recipes and compare the results—in their flavor, how they behave in the pan, how they handle out of the pan and their shelf life. I narrowed the choice down to seven of the most varied recipes I could find and prepared all the crêpes the same way, then offered them to a select crêpe fans. My conclusion is the same as theirs—the simpler the ingredients the best, and most workable the crêpes are.

The recipe that produced the best crêpes calls for very little egg and just a touch of oil. This is fortunate because a crêpe fillings are not always light—so you want at least the wrap to be modest in calories. The small amount of oil not only helps to avoid sticking but also keeps the crêpes pliable for folding or rolling and reduces the chances of drying out.

To prepare the batter, mix all ingredients until you have a smooth paste. Overworking is not critical so you can use a blender or food processor. To make sure the batter is lump-free without using a machine, add the water slowly and work in each addition thoroughly. Lumps are easier to get rid of in a thick batter, so keep it smooth before you thin the batter. If you use a machine, let it work until all lumps disappear. If all fails and you cannot remove lumps, press the batter through a sieve.

When the batter is the consistency of heavy cream, let it rest covered for between one and two hours so the flour grains have a chance to absorb moisture and swell slightly.

The crucial step is to learn how thin your batter should be. Because the moisture content of the flour, size of the eggs and humidity in the air vary, no recipe can prescribe an exact amount of water to assure the right viscosity. If it is too thick, the batter will not quickly coat the bottom of the hot pan and you will end up with a small, thick, pancake-like crêpe that is nearly impossible to neatly roll or fold. If you thin the batter too much, there is not enough egg in each crêpe to produce a strong structure.

A good batter is very thin, almost like a thick puréed soup or a thick cream, and runs readily. Begin with a batter that is a little too thick, test it in the pan and gradually thin it with water if necessary. Keep thinning it until you can swirl the batter around to coat the bottom of the hot pan in 5 seconds. Once you have the feel for the correct consistency, next time it will be easier to judge the correct dilution. Discard the first few crêpes until you get it right.

When crêpes became popular in America. in the 1970s, crêpe-cooking gadgetry flooded kitchen stores, including up-side-down pans that heat from below while you cook the batter on the hot dome-shaped upper side, and including a number of electric crêpe makers. I haven't experimented with many of these—to me the old-fashioned crêpe or omelet pan works very well.

How to make crêpes

Making good crêpes takes no more than a little practice and one or two crêpe or omelet pans. It may take you 15 minutes to master this simple culinary art, may take you longer. (Your not-too-finicky pets will be delighted to get rid of your failures and call them successes.) You need a frying-pan with a flat bottom and gently sloping sides. Using a regular sauté pan with steep sides is difficult and frustrating. The crêpe takes up the entire bottom and in a steep-sided pan they are hard to turn over and remove.

Cookbooks instruct you to reserve a pan just for crêpe making. I find this unnecessary. We all have limited storage space and budget. Once a pan, any pan, is properly seasoned, you can use it for any purpose as long as it remains seasoned. What seasoning does is to coat the metal surface with a fine film of oil, filling the microscopic irregularities and preventing food from sticking. Using soap and water removes that film. To clean up a well-seasoned pan, rinse it with plain hot water or wipe it out with a paper towel and it is ready for the next use. If you prefer a non-stick pan, that works well for crêpes, too. I like a 10 to 11-inch (25 to 28-cm) omelet pan best.

It is more efficient to make crêpes in two pans at a time. You can make double the number of crêpes in the same amount of time by staggering the starting of each. You do need two identical pans so the cooking time is the same in both—while one is just browning, the second is ready to come out. Add the batter to the first pan, and a minute later to the second pan. As you turn over the original, the second pan is browning the first side of that crêpe. Lift the finished crêpe from the first pan and turn over the one in the second pan. Then pour more batter into the first pan, and so on. With a little experience you can average a crêpe in less than a minute. Experienced professionals use three pans at a time. It is not as hard as it sounds, but how many of us have three identical crêpe or omelet pans?

Once you start cooking the crêpes, make sure nothing interrupts your rhythm. Prepare everything you will need beforehand. A little bowl of oil (or melted clarified butter) and a brush to just barely coat the pans, a spatula for loosening the cooked crêpes and turning them (if you are good, you can flip them without a spatula) and a plate to stack them. You don't have to keep coating the pan with oil every time after the first few. Enough oil sticks to the surface to keep several more crêpes from sticking. If you want the characteristic brown mottled appearance, though, it is best to oil the pan each time you start a new crêpe, so the first side, which will be the outside of the finished crêpe, looks good.

Since crêpes are so thin, they cook very quickly in a hot pan. The first side should brown in less than a minute. Once you turn it, the second side only needs 10 or 15 seconds, just until a light beige color has developed. If you brown the second side too much, the crêpe loses too much moisture, it becomes crisp, rigid that is hard to roll or fold.

How to roll and serve

There are two traditional ways to roll a crêpe: into a cylinder if the filling is firm, or folded like an envelope or packet if the filling is soft and there is a chance for leak.

To produce a simple rolled crêpe, lay out a crêpe pretty side down, spread filling over the surface almost to the edge and roll up like a thick cigar. Place on a plate seam down. For a runnier filling, place the filling on the lower third of the crêpe (the third nearest you), roll the crêpe around the filling away from you until you reach the center. Then fold in the two sides quarter way over this partial roll and continue rolling all the way so the tucked-in sides are part of the roll. Place on lightly

oiled baking sheet (if it requires further baking), or on plates seam side down if ready to serve.

When the filling is just a smear, like lemon juice and sugar or an apricot jam, you can present crêpes still another way. Spread the filling over the surface and fold the crêpe over the filling into half. Fold in half again to make a quarter of a circle. Serve as is, dusted with powdered sugar, cinnamon, cocoa or anything that complements the filling.

Crêpes are best warm, though when you munch on the leftover crêpes from your refrigerator the day after the dinner party, you realize they taste pretty good cold, too. Most crêpes benefit from a generous coat of melted butter brushed on their surface before rewarming them. This creates a slightly crispy top surface with a rich brown color, shiny glaze and a hint of browned butter. The crêpe still remains soft underneath.

Crêpes don't like to be nude. Dress them up at least with a light dusting of icing sugar, or, for a classier look, add a sauce. Choose one that complements the filling. First, nap the plate with a dab of sauce before placing the crêpe over it, then drizzle or streak or just splash more sauce over the crêpe, and you have a magnificent-looking dessert. You can even use two different sauces—perhaps a fruit sauce on the plate with a zig-zag of chocolate syrup to dress up the crêpes themselves.

Count on one crêpe per guest with a few extras for seconds for people having more than one sweet tooth. Make sure to use a generous portion of filling, the essence of this dessert. The wrap is only to hold in the filling.

The filling for dessert crêpes can be as simple as a sprinkling of sweetened cocoa, or elaborate with ground nuts, chocolate, cheeses, eggs, spices and zest with a harmony of flavors. Crêpes are exceedingly versatile and suitable for any meal: breakfast, brunch or lunch as an entrée whether it is slightly sweetened or savory, or as dessert for lunch or dinner. Crêpe buffets, where you provide the crêpes and a choice of fillings, are in high esteem, too. You can either stack the previously prepared crêpes on a serving dish or prepare them as the center of attraction while your guests watch. They may be the element of a great, memorable buffet party.

Storing them

You can prepare both crêpes and most fillings days in advance. They are best filled shortly before serving, though they hold well for hours even with filling. Good crêpes will not get soggy even with a very moist filling. If you decide to fill them early, pop them in the oven just before they go on the table. Some crêpes are fine served at room temperature.

Unfilled well-wrapped crêpes also freeze well and defrost in minutes, which makes a good reserve dessert course when you just don't have time to whip up anything else. Remove them from the refrigerator or freezer, sprinkle lightly with water, wrap tightly in aluminum foil and heat them in a 350°F (180°C) oven until very warm, about 10 minutes. Without this heating they are a little too stiff, hard to roll or fold.

Yeast-Leavened Desserts

Europeans commonly serve yeast-leavened sweets as desserts. To North Americans, items like yeast-leavened coffee cakes (German *kugelhopf* and its French next of kin, *baba au baba,* or *savarin*) or sweet doughs with a filling are more apt to be on the breakfast table or served with an afternoon coffee.

The most basic yeast-leavened dessert is a sweet bread dough with a filling of nuts, fruits,

dried fruits, jams, marmalades, ground seeds (such as poppy seeds) or even sweetened mild cheeses. There are two common ways to bake yeast-leavened desserts—in a bundt or other deep fluted pan so the finished product comes out tall, pretty and appetizing, or in individual portions such as cinnamon rolls. Because they are high in sugar, their keeping quality is far longer than that of breads. The sugar helps to retain their moisture and their butter content also contributes to longer freshness. They stay perfectly delicious for several days under tight cover.

A Danish pastry is the most complex yeast dough. It starts as a yeast dough that the baker structures into a puff pastry (ordinary puff pastry is not yeast-leavened). Here are the basic steps. First you prepare a basic sweet yeast dough, then you fold the butter in, rolling and folding six times while chilling after every two foldings. Finally, after the last chilling, you roll out a thin dough, cut it into Danish-size pieces, about 4 or 5-inch (10 to 12-cm) squares, fill each, fold seal and bake.

To make Danish is a healthy challenge and fun for some home bakers, others prefer to buy theirs at a good bakery. Even commercial bakers don't make Danish themselves—they are too labor intensive. The dough comes ready-made, either frozen or refrigerated, already cut into individual servings. They warm up the pastry, proof it, fill it and bake it. The filling comes out of cans or large plastic buckets delivered to the bakery ready-made. So much for fresh home-baked. But don't be discouraged. If you mastered a simple puff pastry and you are good with yeast breads, a good Danish is within your reach.

Yeast desserts are not the easiest or fastest desserts to make but one of the most satisfying. That is why all sweet yeast pastries are so popular everywhere. Just think of donuts, cinnamon rolls and Danishes.

Ice Creams and other Frozen Goodies

North Americans consume far more ice cream than any other group in the world. The average consumption is 6 gallons (23 liters) a person per year, far more than the second highest consumer, New Zealand. Why? Is our ice cream so much better than anywhere else? Is it perhaps that we have more freezer space both in our markets and in our homes? Is it more reasonably priced, or offered in more varieties? Is it because it is quick and easy, or do we just simply love ice cream? Whatever the reason, almost every freezer in the U.S. and Canada contains ice cream, although frozen yogurt is taking its place in more than a few freezers.

Our ice cream heritage

The French and the English knew frozen desserts as far back as in the 1600s, possibly even in the 1500s. However, some type of flavored ices were popular with the Romans 2300 years ago. These were probably not ice creams as we know them today. At the time of Charles I they called them "cream ices," and a recipe for true ice cream appears in an English cookbook printed in 1760. Storage may have been a problem in those days and transportation a challenge without modern refrigeration. Today processors use both chemical substances and technological know-how to create that lusciously smooth, fine-grained, velvety texture that characterize good premium ice creams.

Ice cream in the U.S. became genuinely popular during World War II. As often as was feasible, the U.S. troops had ice cream delivered to them to end their meals. It continued gaining popularity after the war, a growing trend that never lost its momentum. Now even Asian countries import American ice creams, even though some of these Asian countries people consume barely 4 tablespoons milk (or its equivalent) dairy per person every day. If they have dairy, it might as well

be ice cream.

What about "sundae"? Ever wonder how that creation got its name? Actually, it is related to that day of the week, Sunday. An enterprising individual invented it in the 1890s when he decided to combine ice cream and sparkling water. They became extremely popular. Midwestern blue laws, backed by the churches, forbade the serving of such pleasurable items as ice cream sodas on Sunday. Since they allowed ice cream, another enterprising individual created a jazzed-up version, by pouring hot chocolate sauce over a dish of ice cream—a creation reserved for Sundays. This was another instant success.

Home-made ice creams are not common dessert items, though it was a good family tradition in our great grandparents' time. To make good ice cream in your kitchen, you need time, specialized equipment and a fair amount of expertise along with a generous scoop of patience. There are now ice cream making tools and machines to make the job less difficult, but they haven't caught much attention. The end product is not usually as flavorful and smooth-textured as modern commercial varieties, and it often costs more to make it at home. Ice cream may be one of those rare exceptions where the commercial product probably beats homemade. (My apologies to those who disagree.)

How do they make ice cream?

Ice cream is basically a frozen custard. The ingredients of a standard custard are milk, cream, egg and flavoring. But egg in ice cream is an optional ingredients. Premium ice creams include it, the more economical garden varieties usually do not because eggs up the cost. The eggs in ice cream may be whole eggs or egg yolks. If the processor uses heavy cream, the ice cream is richer, smoother and denser. Milk or light cream make a lighter texture. The processor uses a combination of different milk products to provide the specified fat content, percent milk solids (U.S. law specifies a minimum amount for both) and ideal density.

> **TASTINGS Airy ice cream**
> The dairy industry calls the amount of air whipped into ice cream the *overrun*. Some overrun is desirable by the consumers—they give light airy texture to the ice cream. If the overrun is high, you are eating air instead of ice cream which is good for dieters but not for gourmets. In the U.S. the maximum allowable overrun is 100 percent, which means the ice cream maker can double the volume of the original mixture with air. Inexpensive ice creams have the maximum allowed overrun, premium ice creams have less. You get what you pay for.

There are several critical elements involved in making good ice cream: the temperature of the custard when it is ready to freeze, the amount and speed of whipping to incorporate air into the mix and the rate of cooling, to name a few. The rate of cooling and the amount of stirring determine how smooth your ice cream will be. High school physics may have taught you that fast cooling results in many tiny crystals, while slow cooling develops fewer, larger crystals. Rapid stirring also decreases crystal size. The finer the crystals, the smoother and less crunchy the ice cream is. Commercial producers with sophisticated cooling equipment can chill the mixture quickly and add compressed air to keep the crystals small.

Such close control is impossible for the home chef. As a first requirement, start with a good recipe, then follow your equipment's manual. Practice, change ingredients, proportions, the total whipping time and speed (if you can) until you get the ice cream you like. Home-made ice cream

has an aura a fabulous, old-fashioned dessert that your guests will always anticipate with great expectations.

Who is who in the frozen dessert arena

Now that we know ice cream and sundae, let's look at their close siblings *frozen custard*, *French ice cream* and *French ice cream custard*, all enriched with egg yolk or whole egg and all have higher milk fat contents than ice creams. *Ice milk* is lean sibling that has milk instead of cream, while *sherbet*, also called *sorbet*, contains even less milk or no milk at all. But don't be fooled if you are diet conscious—sherbet has just about the same calories as ice cream. Sugar makes up for the lost milk fat. Fruit purée or fruit juice and heavy sugar syrup are the main ingredients. But the French make a barely sweetened sorbet so light they serve it between courses to cleanse the palate.

Gelato is an Italian variety of especially rich, creamy ice cream.

Granite, granité or *granita* is a light frozen fruit juice dessert originally from Spain. To make the granular, sandy texture of granite they let the fruit juice mixture freeze without stirring.

Spumoni is an Italian sherbet blended with large amount of Italian meringue. (Italian meringue is cooked beaten egg white sweetened with hot sugar syrup.). It is wonderful.

Parfait is a frozen dessert with a rich egg yolk custard base, whipped cream and flavoring. You freeze the ingredients in individual serving containers, usually long, tapered parfait glasses. It is very delicate with plenty of air whipped in for a light texture. The mixture is great in frozen cakes, too. In the U.S., the term often refers to a dessert made up of alternating layers of ice cream and sauce served in a stemmed glass, but that is not an authentic parfait. The American style is not only easier, with no cooking involved, but can be much lighter if the sauce is not too rich.

Frozen soufflé is similar in composition to parfait with one or two additional ingredients. You add gelatin to the thickened egg yolk along with the fruit, fruit juice, chocolate or other flavoring. After you fold in the whipped cream and egg whites, you freeze it in a soufflé mold. If the custard and gelatin solidify too much, you will have trouble folding in the whipped cream and egg whites. Watch it closely while chilling to catch it at the just right consistency for ease in folding them in. Taking it out of the freezer and letting it soften a little before serving is also a matter of timing.

Bombe is a combination of frozen parfait and ice cream. It is an elegant, classic French dessert. The presentation is impressive. You can do it at home without much expertise, but you do need tall, narrow glassware to serve it in or you sacrifice the effect. To make a *bombe*, smear softened ice cream on the lightly oiled inside surface of individual, well-chilled parfait containers, and put them in the freezer until the ice cream is solid again. Remove the glasses and fill with soft parfait all the way to the top. Return the filled glasses to the freezer until the mix freezes solid. Serve them directly from the freezer with mint or edible flower garnish to a conversation-stopping dinner party—as if a bomb fell on the table.

The French have special large molds specifically designed to make large *bombe*. After unmolding, they cut the *bombe* into individual multilayered servings. Traditionally, they pour sauce over the slices before serving. Expect to spend some time in your kitchen when making bombes.

Baked Alaska is our very own spectacular dessert, yet it is nothing like preparing a *bombe*, in fact, it is easy even though sounds intimidating. You hardly need a recipe to make baked Alaska but try this one.

Baked Alaska

An American physicist invented baked Alaska, this classic American dessert some 200 years ago. It is an ice cream that you bake in a hot oven, yet it will not melt. Hardly anyone makes it any more—bakers think it is too difficult. Read through this recipe and decide for yourself. You do need some kitchen skill to make Baked Alaska, but what you need most for success is some advanced preparation, good organization and be able to work quickly. Here are the two steps to make Baked Alaska:

1. You start with a slab of cake which will be the base and a block of ice cream sitting on it. Trim the cake it so it is just a little larger than the block of ice cream. Place the ice cream over the cake base and return it to the freezer.
2. Beat the egg whites to foam. Thickly cover the ice cream with the foam, that will protect the ice cream from melting. Bake in a hot oven until the meringue is nicely browned.

Fresh out of the oven, this looks like a masterpiece—no one knows how easy to bake this Alaska.

Ingredients

1 small, stale, simple, un-iced cake, such as a sponge cake or butter cake (home-baked or store-bought)

2 tablespoons fruity liqueur that complements ice cream flavor (optional)

Slices of fruit of berries to cover the cake base (optional)

1 quart rectangular-shaped ice cream, flavor of your choice; if you cannot find a quart size in that shape, buy a rectangular half-gallon size, soften it a little and cut it in half so you have two cubes; use one cube for this recipe, freeze the other cube

4 egg whites at room temperature

¼ teaspoon cream of tartar

½ cup sugar

wooden cutting board, little larger than the cake base, covered with foil

Procedure

1. Trim the cake with a serrated bread knife to two fingers thick and a finger wider and longer than your ice cream block. Place it on the middle of the foil-covered wooden board. If using optional liqueur, sprinkle it over the cake. If using optional fruit, place slices or berries on cake.

2. Place the ice cream on the middle of the cake with a narrow uncovered cake margin left all around. Return into freezer and pre-heat oven to 475°F (250°C).

3. Make sure that everyone is ready for the dessert when it is ready. Baked Alaska will not wait for a minute for anyone.

4. Beat the egg whites with the cream of tartar to soft peaks (see Foam from egg whites in this chapter). Reduce the mixer speed to slow and gradually add the sugar. Keep whipping the egg whites until the sugar is dissolved and you reach the stiff peak but not dry stage, another minute or two.

5. Take the ice cream from the freezer and with a rubber spatula spread a thick layer of the egg white foam over the top and on four sides of the ice cream all the way down to the cake base. You don't need to smooth the foam, leave it rough-looking. Place the assembly on a small baking pan and put it into the pre-heated oven on a middle rack.

6. Watch the meringue closely. In about 5 minutes it should start getting lightly brown. Leave it in for a few minutes longer, if necessary. When brown all over, the meringue is done. Take it out of the oven, put the board and baked Alaska on an attractive serving platter and serve. Slice it with a large thin-bladed knife or serrated bread knife.

Serves 8.

You can refreeze any extra piece covered well with a plastic wrap.

Fruits

Rich desserts are slowly giving way, in weekday meals at least, to sweets that are far leaner, lower in fats and eggs, and contain less sugar. Our focus on healthier foods virtually demands that. The most natural substitute we can think of is a fruit-based sweet.

Not that fruits are new as dessert item. The French have long had the tradition of ending a simple weekday meal with nothing more than good fresh fruit and a full-flavored ripe cheese, perhaps with some fresh-toasted nuts, all put on the table at room temperature for the most pronounced flavor. Fruits and cheeses complement each other's flavors like a buttery shortcake and strawberries do—the fruit softens and cuts the rich taste of cheese. But fruits and cheeses are not accustomed combination for the American palate.

For a simple last course you can serve fruits raw, for a fancier course you can bake, stew or poach many fruits. You can serve fruits with dessert sauces, syrups, ice creams, sherbets, or just simply with complementing liqueurs. Or you can use a dipping sauce to coat them, such as chocolate-dipped strawberries. The warm, liquid dipping sauce solidifies as it cools. Fruits with least embellishment now appear on restaurant menus and dining room tables. The more diet-conscious your guests are, the more popular you will be with a simple sliced fruit platter to end your meal. But your guests with a sweet tooth will remain unfulfilled. Adding a little cheese and fresh-roasted nuts gives weight to this final course.

Fruit basics

Even before they knew about such things as fire, cooking and kitchens, our early ancestors a million years ago picked ripe fruits when they found them. Eventually, around 10,000 years ago, they learned how to cultivate them, and made fruits not only more readily available, but in abundance. The love of fruit may even be a basic instinct in humans. Ripe fruits with their high sugar content provide quick energy and plenty of vitamins and minerals to keep the body healthy.

Fruits are easy to digest and are often the first solid foods babies eat. Very few human beings dislike fruit in some form or another. No religion prohibits fruit of any kind, and neither do nonsectarian organizations, except for political reasons, for example as with table grapes in California to protest the working conditions of the field workers. Fruits have a truly universal appeal.

Will it ripen or not?

Fruits fall into two categories, based on where they grow: fruits of temperate climate or tropics. However, there is another way to classify them that is far more important to us in the kitchen—a classification that many of us know by instinct. We know, for instance that inedible,

starchy green bananas ripen in a few days and changes into a sweet, delightfully satisfying fruit. But let an unripe pineapple sit at room temperature for a few days, instead of turning sweeter, it starts to spoil. Accordingly, scientists divide fruits into *climacteric* and *non-climacteric* types.

Climacteric fruits continue to ripen after the harvest, while non-climacteric fruits do not. It pays to know about this difference when you buy and store your fruit. If the fruit belongs to the first group, go ahead and buy it even if it is not fully ripe. It will finish ripening in your kitchen if you store it properly.

But if you buy a non-climacteric fruit that is far from ripe, no matter how you store it, how to coax it into softer and sweeter phase, it will not ripen any more. The way they picked it the way it will remain. Its next stage of development is rotting. Strawberries are a good example of non-climacteric fruit.

Below there is a long list of the two types of fruits. So you don't need to pull out the list each time you are shopping, here is an easier way to remember for the most common fruits that will *not* ripen, no matter what you do are

➔ cherries, grapes, pineapple, all berries, citrus fruits and melons. ➔

Although scientists list apples under climacteric fruit, experience tells us that an unripe apple is so slow to change for our purposes and we can call it a non-ripening fruit.

Here is a more extensive list of climacteric and non-climacteric fruits.

Climacteric Fruits	**Non-climacteric fruits**
Apple	Blueberry
Apricot	Cherry
Avocado	Grape
Banana	Grapefruit
Cherimoya	Lemon
Feijoa	Lime
Fig	Lychee
Kiwi	Melons
Mango	Olive
Nectarine	Orange
Papaya	Pepper
Passion fruit	Pineapple
Peach	Raspberry
Pear	Strawberry
Persimmon	Watermelon
Plum	
Tomato	

Climacteric fruits contain starch that enzymes convert into sugars during the ripening process. These enzymes are organic catalysts that speed up the chemical reaction of ripening but don't take part in the process. Once the fruit is fully ripe, you better use it fast because the enzyme catalysts continue to act and convert your just-right fruit into rotten fruit. At full ripeness a climacteric fruit has converted most of its starch into sugar.

If you cannot use ripe fruit immediately, the trick is to convert or destroy the enzymes and stop the ripening process. You can do this three different ways:

1. Heat the fruit to near boiling to deactivate the enzymes and stop the action completely.

A quick blanching in boiling water works. (That is why we blanch all fruits and vegetables before preserving.)

2. You can deactivate the enzymes by freezing the fruit, too. Although freezing doesn't destroy them, they cannot continue their activities.
3. You can also slow the enzymes' action down drastically by cooling the fruit to refrigerator temperature. You have already personally witnessed the fact that this doesn't stop the ripening action completely, if you ever found fruit tucked into the back corner of the refrigerator's vegetable bin weeks after you placed it there. Cold only retards enzyme action.

TASTINGS How they discovered fruit ripening

Commercial producers ripen mature fruit with ethylene gas. They discovered the process in 1924 when growers started using kerosene heaters in California's San Joaquin Valley orchards to avoid frost damage. They were dumbfounded to discover that fruit ripened faster in the vicinity of the heaters. Eventually, researchers traced the accelerated mysterious change to ethylene gas that the heaters gave off.

A ripening fruit produces ethylene gas. The riper it is, the more gas it produces. An astonishingly tiny amount of this gas will ripen climacteric fruit (0.1 to 1 part per million). Climacteric fruits continue producing ethylene after they are harvested, and this continues the ripening process. The way fruit packers ripen fruits artificially is to expose them to ethylene gas under controlled conditions.

Non-climacteric fruits refuse to ripen further after taken off the vine or tree, no matter how long they expose them to ethylene gas. They do undergo subtle ripening-like changes but there's no increase in sugar. They do lose some of their acids and tannins when in storage and seem sweeter because they have lost some of the sour, bitter or astringent taste.

Ethylene gas is helpful to growers, wholesalers and retailers, but not to consumers. Very few fruits will achieve the flavor of natural ripening through this artificial method. Two exceptions are bananas and pears.

These days mature ripe fruit is almost unavailable, except at farmers' markets and farm stands. Ripe fruit is too soft to withstand the rigors of transportation and handling, and has too short a shelf life to survive lengthy storage. Picking fully ripened fruit is uneconomical—the chain between growers and retailers has grown too long. The fruit you see in your supermarket is a compromise. It is picked while still very firm, what growers call the *mature* stage, the growing stage at which a climacteric fruit will ripen even if harvested green. Legally growers can call these mature fruits "vine-ripened" even when picked virtually inedible green.

Wholesalers and distributors may further ripen the billiard ball-hard mature fruit in their warehouses before delivering to the retailer almost ripe. At this stage the fruit is still very firm, something like a ping pong ball. The retailer may continue ripening in their storage area but the fruit still must remain in tennis ball-firm, perfect and unblemished condition or the consumers will not buy it. Only firm fruits can withstand the rather rough handling fruits go through before they are in the display case and most firm fruits are not fully flavored, ripe fruits. It is your job to complete the ripening process. How do you accomplish that?

Imitating fruit distributors is a good idea. You want to preserve the ethylene gas many ripening fruits emit to accelerate the process. Keeping the unwashed fruit in a heavy closed paper bag is the best way. Enclosing a banana helps, if you have one—banana is a generous ethylene

emitter.

At refrigerator temperature fruits ripen very slowly. But if your storage temperature is too high, the rotting process starts before the ripening process is complete. At these temperature off-flavor also develops and the fruit tends to dry out. Good ripening temperature is between 50° and 75°F ((10° and 24°C). At the lower end of this range ripening is the slowest, at the higher end it is the fastest. The worst temperature for ripening is between 35° and 45°F (2° and 7°C)—fruits become mealy. (Although below freezing is even worse—they become mushy.)

Fruit storage

Post-harvest storage is one area where food technology has made tremendous advances. Temperature, humidity, air circulation and introduction or removal of certain gases can extend the storage life of fruits significantly. Ideal conditions vary with different fruits and must be strictly followed to allow the fruits to leave storage in top condition for transportation to the retail stores and the final ripening.

> **TASTINGS Fruit storage times**
> Fruits vary much in their ability to remain firm and tasty in storage. For example, apricot storage at their ideal near-freezing temperature is limited to 2 or 3 weeks but raspberries only for 2 to 3 days. On the other hand, grapefruits at their favorite very cool room temperature keep well for 4 to 6 weeks, while apples stored at slightly above freezing temperature up to 12 months.

Both flavor and quality deteriorate with storage as you have no doubt experienced at the end of, say, the apple storage season in the spring. You bite into that shiny, crisp-looking Golden Delicious expecting firm texture and sweet-tart flavor but you get flavorless mush, and perhaps, if you are unlucky, the beginning of a brownish rot in the center.

How do you store fruits at home to maintain flavor and texture? Except for citrus fruits, tropical fruits don't like it cold—they prefer cool room temperature. Fruits that spoil quickly, as all berries do, keep best in the coolest part of the refrigerator. Temperate climate fruits, such as apples, pears or plums like it very cool, too, once they are fully ripe. Remember, that all fruits are still alive and they need to breath. Don't store them in a fully-closed plastic bag—open the bag partially so they have access to the oxygen in the air. Those fruits that have thick skins, like melons, don't need to be in a plastic bag. Their skin protects them from drying out.

All fruits are high in liquid and your job is to preserve that. High-humidity storage is a key, and that is why they designed fruit and vegetable drawer for your refrigerator. Remember, also, to check your stored fruits from time to time. One spoiled fruit that you have overlooked can quickly spoil the rest as microorganisms from the spoiled infiltrate through weak spots of healthy fruits.

When you need fruit for cooking out of season, it is often a better alternative to use commercially frozen fruit. Growers pick fruits for processing fully ripe since bruising and appearance are of no concern for that end. They transport them within hours to the processing plant, and in a few more hours they are frozen solid or canned. Conduct your own test, making the same recipe with both out-of-season fresh and fresh-frozen fruit. Chances are the frozen will win. Besides, frozen fruit is frequently more economical.

Flavor and appearance

Most fruits contain tiny amounts of more than a hundred different volatile and aromatic compounds and the combination of these that gives each fruit its characteristic flavor and scent. Usually one or two compounds predominate. As the fruit ripens, the relative amounts of these compounds change, some new ones appear and others disappear in the highly complex ripening process. In the same time flavor, texture and aroma change steadily. Give your next pineapple the nose test and experience these aromatic chemicals yourself.

Enzymes that cause oxidation that in turn causes surface browning are present in many fruits and vegetables. Food scientists call this process *enzymatic browning*, a process that is different from the browning reaction I discussed under Meat chapter. Enzymatic browning is the same reaction that makes nuts and seeds rancid (oxidizing the oils) and change the flavor of stored milk products. Food processors use antioxidants to retard oxidation. Blanching also stops browning by deactivating the enzymes, while refrigeration slows it drastically and freezing almost stops it. If you keep the fruit in your freezer a long time and the package is not airtight, oxygen can sneak in and allow the enzymes to do their nasty work.

The easiest way to prevent browning in freshly cut-up fruit is to dip it into lemon juice. Any acid will do but lemon juice interferes least with the fruit flavor. Acid halts the enzymatic reaction. Antioxidant powders is another choice and are available near the canning supplies of the supermarkets. They contain citric acid, don’t transmit flavor to the fruit and are inexpensive. Dissolve a small amount in water according to package directions and drop the slices of fruit or vegetable into the solution for a few seconds.

When you serve cut-up fruits, use either lemon juice or these antioxidant powders to keep your platter attractive. They are effective for hours. Fruits that don't carry the browning enzymes or naturally acidic don't turn brown after cut, they include melons, citrus fruits and pineapple.

Fruits have become much more beautiful since the 1930s and 1940s; much larger having a lovely color and free of blemish as a model's face, but taste has been sacrificed for beauty. Growers pick fruits when the color is most attractive—for example, Granny Smith apples achieve their technicolor green before their ripe stage. In the fully ripe stage they turn yellowish green, a color not quite as attractive to buyers. As a result, consumers have gotten used to blander, firmer fruits and many even like fruits that way. Fully ripe fruits don't sell well even at farmers' markets. While technological advances in transportation, storage and refrigeration allow a huge variety of fruits from all over the world on supermarket shelves, the decrease in flavor is a high price to pay.

There are a few fruits we cannot imagine eating any other way but well chilled, for example, watermelon. But the flavor of most fruits, like cheeses, bloom at room temperature. Our taste buds can detect flavors far better when foods are not chilled. Plan ahead when serving fruits, give them time to warm up.

Desserts Outside Pigeon-Holes

I still haven't covered all the dessert possibilities. Here are some great desserts that don't fit into any of the categories I’ve discussed.

Cream puffs

Our cream puff pastry is the same as the *choux paste* in French cuisine. It puffs up in a hot

oven same as a Yorkshire pudding. And here is the confusion that leaves many cooks scratching their heads and look for a cooking encyclopedia. *Cream puff pastry* is completely different than *puff pastry*. We use cream puff pastry to make cream puffs and puff pastry to make turnovers and Napoleon. To avoid the confusion, some bakers call cream puff pastry *cream puff paste*.

The process of making cream puff pastry seems forbiddingly difficult but it is not, and it is quick. Puff pastry is more involved and anything but quick. You can summarize making cream puff pastry in a few sentences: boil water and butter in a sauce pan, stir to form a hot emulsion, about half a minute. Stir the flour in all at once. The heat makes the starch swell and gelatinize in seconds to form a smooth, hot paste. Add the eggs, one at a time, and blend into the gelatinized paste. Stir in more liquid to get the correct consistency and you have cream puff pastry. It is as simple as it sounds.

Spoon the pastry on an oiled baking sheet like you would drop cookies or, for prettier appearance, use a pastry bag. Brush with egg wash that will turn the top to a golden yellow and bake in a very hot oven. The eggs act as a leavening agent as well as structural framework for the puffs. Each pastry mound puffs up 3 or 4 times its size with a large air cavity inside.

Cream puffs, like crêpes, are neutral in flavor and you may fill them with virtually anything sweet, creamy, soft or semi-soft. Vanilla pastry cream is a common choice. To make your cream puffs even jazzier, try a thick fruit mousse filling.

Unfilled, the puffs store well in the freezer. To refresh, place them on a baking sheet and bake in a warm oven for 5 minutes.

Puff pastry

One of the most ingenious French creations is the buttery puff pastry, the basis of many truly great, wonderful creations two of which we know well, turnovers and Napoleon. Croissant is similar in most ways to puff pastry but it is yeast-leavened.

The basis of puff pastry is a simple flour-water dough into which you fold a generous quantity of cold butter. After chilling, fold the dough into three like you fold a letter, repeating five more times, rolling out and chilling in-between. Eventually you end up with a smooth, pliable dough with 729 layers (if you count the folds in the description above, you should come up with the same number). A very thin film of butter separates each layer from its neighbor.

When you bake puff pastry, in the hot oven the moisture in the butter turns into steam, slightly raising each and every layer. Biting into a turnover you are biting down on 2 times 729, i.e. 1458 layers (since you turned over the turnover pastry one more time).

Making a good puff pastry is not an easy baking task but one of the most satisfying ones. Once you master it, you are addicted to it (both to making and eating). Puff pastry freezes very well at any stage—in the pastry form after cut into ready-to-serve pieces, filled ready to bake or when fully baked. Wrapping it well is essential to prevent butter turning rancid.

Puff pastry

Making a good puff pastry is a sign of an accomplished baker. Besides having a good recipe and precise instructions, keep making it several times until you master the technique. Once you make a good puff pastry, the process is quite easy. Although it takes little actual working time, the whole process is slow because the chilling after each folding. Puff pastry is the basic pastry for a

number of French pastries, but any leftover pieces are good by themselves. They taste like rich, buttery croissants. Rightly so—they have twice the amount of butter than croissants.

This recipe calls for a mixture of cake and all-purpose flour—the combination works well for a good puff pastry dough. If you have no cake flour, use all-purpose. You will still get a perfectly good pastry. The vinegar in the recipe helps to relax gluten that makes rolling easier.

Ingredients

1 cup cake flour
1 cup all-purpose flour
1/3 teaspoon salt
½ cup water
1½ teaspoons vinegar
½ pound (225 g) unsalted butter, warmed slightly to about 50°F (10°C)
1 tablespoon flour

Procedure

1. Blend the two flours and salt on a large cutting board with a spoon, by hand or with a bench scraper, and form it into a mound. Make a well in the center.

2. Add vinegar to water and pour into well. With fingers or bench scraper combine water and flour to form a dough. Add slightly more water or flour to make the dough workable, not sticky, not dry. Cut about 1 tablespoon off from butter and use fingers or pastry cutter to thoroughly cut it into the dough. Knead just until smooth and elastic. Wrap dough in a plastic wrap and chill at least 12 hours.

3. Dust cutting board with 1 tablespoon flour. Place butter over flour and knead the flour into the butter with the heal of your hand. Flour absorbs the extra moisture from butter. Work very quickly before the butter has the chance to warm up. Form kneaded butter into two flat rectangular block about 4x4 inches (10x10 cm) each. Chill.

4. Warm both dough and butter slightly before the next step. The ideal temperature to work it is about 55º to 60°F (13º to 16°C). Roll out dough on a flour-dusted surface to an elongated rectangle 14x5 inches (35x12 cm). Place first butter block over the lower third of the rectangle, fold dough and butter over the center third, place second butter block on dough and fold over top third. Seal edges by pressing with finger.

5. Very gently roll dough out into a elongated rectangle, making sure that butter doesn't ooze out around the edges. Should butter start warming up, return to refrigerator for 15 minutes. Starting from the short end, fold into three business-letter fashion. Rotate dough on the board 90º, dust a little more flour on board and rolling pin and roll again into a rectangle as before. Fold once more into three and gently flatten dough with the rolling pin. Wrap in plastic wrap and chill at least 30 minutes (longer chilling will not hurt dough).

6. Repeat rolling out and folding twice more then chill again for 30 minutes. You should have a total of six folds. Refrigerate for several hours before using dough. Warm up 10 minutes before final use.

Recipe makes 1¼ pounds (570 g) pastry, enough for 6 to 8 turnovers or similar size pastries. The pastry freezes well. Best to cut and roll it into size and shape into your intended application, and freeze, stacked with plastic wrap or waxed paper in between.

Strudel

It wasn't long ago that village girls in Central Europe had to prove their skills at strudel making before they were considered eligible for marriage. Now hardly anyone has that skill. Strudel pastry, same as the Greek *phyllo* (or *fillo)* pastry used in baklava, is a very difficult pastry to make. Even when you know how to do it, it is one of the most time-consuming pastries. And when you have finally finished making the pastry, you still have the filling to do.

The starting point for a strudel pastry is either a puff pastry or a simple dough made from water, flour and oil. Instead of oil, strudel bakers may use butter and may also add eggs. A tiny amount of lemon juice or vinegar helps both to relax the gluten and strengthen its structure.

The skill is in turning the dough into a paper-thin sheet, stretching it gently by manipulating your hands from underneath until the fist-sized ball of dough becomes a sheet 4 or 5 feet (1¼-1½ m) in diameter, so thin that you can read this page through it.

What allows to stretch the dough is well-developed gluten, just like in pizza dough. High-protein hard wheat flour and well-kneaded dough are essential for strudel, and the dough must be totally relaxed before it let's you stretch it. While the dough is in the relaxing mode, you can prepare the filling.

Donuts and its step-sisters

There are two types of donuts: cake donuts, in which baking powder provides leavening, and yeast donuts with yeast taking care of making leavening bubbles. They are easiest to make with commercial deep-frying equipment, which is a major reason why they are not a popular home-made desserts. Even though homemade donuts can be delightfully good, they are messy and slow to make with the small deep-fryers available for domestic use. You count on two, even three donuts per person (they go fast), so for a small group of eight people that is a great number of donuts to fry four at a time. They are fun to do occasionally.

Spudnuts are yeast donuts with mashed potatoes in the batter—very nice, rich in flavor. *Sopaipilla* is the Mexican version of a cake donut without a hole in the middle. Having no central hole, it puffs up in the hot oil leaving a huge air bubble in the center of the dough. Traditionally you break it open at the table and dribble some honey into its cavity or simply dip it into honey.

Fruit fritters are also deep-fried desserts. You can dip any fruit that is not very juicy in a simple batter and fry it until crisp. Sprinkled with powdered sugar before serving, they are irresistible, but, like donuts, they are messy to make and most of us avoid them.

Points to Remember

- Use a high-starch cake flour for most tender, crumbly, fine-textured cakes and tortes.
- Use icing sugar only for frostings—the coarse crystals of granulated sugar have a role in dessert preparations.
- Use eggs at room temperature for best results, particularly in whipping egg whites into foam. When whipping egg whites, avoid even traces of oil for maximum volume and add cream of tartar for stability.
- Be gentle when folding egg white foam into other ingredients. Fold briefly to preserve most air.
- Be very accurate when measuring ingredients, especially for cakes and tortes and have all ingredients at room temperature.

- Minimal working the dough with cookies and bars minimizes gluten development, avoids tough and dry cookies and bars. Use all-purpose flour.
- Don't reduce fat and sugar much in cookie and bar dough.
- Make your own pie crust. Use all-purpose flour, fat in pea-size pieces (for flaky pastry) or working it in until fine (for mealy pastry). Work dough as little as possible and add a little acid for tender, flaky crust. Adjust water so dough is neither dry, nor sticky.
- Never let pie dough warm up. Let it relax and chill before rolling and before baking.
- Cobblers, crisps and crunches are one of the simplest and most foolproof of dessert preparations.
- Use gentle and slow heat for puddings and custards to avoid curdling and to produce velvety texture. For safest method, bake them in hot-water bath.
- For easy and elegant desserts, learn to make crêpes. Make many and store in freezer.
- Learn the difference between fruits that ripen after picking and those that do not. Final ripening of fruits is best in heavy, closed paper bag at temperatures between 50° and 75°F (10º and 24°C). Don't expect fruits to ripen in the refrigerator. Once ripe, store fruits refrigerated. Most fruits develop their full flavor at room temperature.
- Tropical fruits, except for citrus fruits, don't do well in refrigeration—they prefer cool, but not chilled storage. Berries, highly perishable fruits and temperate-climate fruits are best in the refrigerator. All fruits suffocate in closed plastic bags. They need air to breath and high humidity to prevent drying out.
- In cooking, frozen fruit is often better than out-of-season fresh fruit.

Coffee should be black as hell,
strong as death and sweet as love
~~~~~

"Water is composed of two gins,
Oxygin and Hydrogin. Oxygin is pure gin.
Hydrogin is gin and water".
From *Russel Harper's collection*
of school test papers gems

(MAINLY HOT) BEVERAGES

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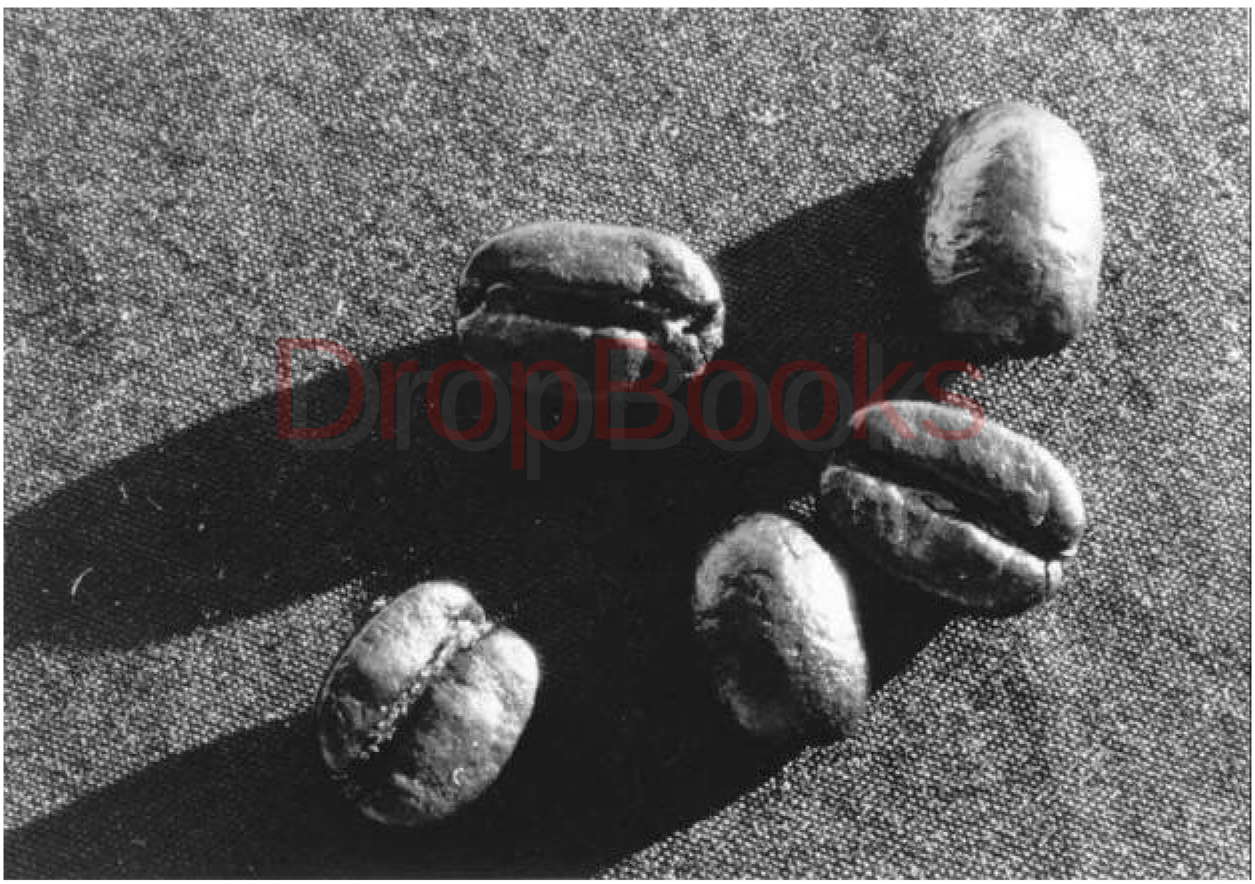

COFFEE

Those of us who are true coffee lovers firmly believe there was no life before the heavenly brew was discovered. But actually, the human love affair with coffee didn't begin until around the year 1000 when Arabs in Ethiopia tried sipping a drink they created when they mixed camp fire-browned crushed coffee beans with hot water into. They liked the invigorating bitter taste and its uplifting, stimulating effect on the mind. Slowly but surely coffee gained popularity throughout the Arab world and Turkey, and was introduced into Europe with the 15th century spice trade. It spread like wildfire, just as espresso did in the U.S. in the 1980s.

Today, we drink coffee regularly in nearly every household in the Western Hemisphere. The volume of coffee traded worldwide is second only to crude oil.

Coffee Facts

Where do all these beans grow?

Coffee beans are the centers of cranberry-sized fruits that grow on a small tropical evergreen tree. Two types of coffee trees are actually in cultivation, the original *arabica* which produces higher quality, more flavorful beans, and *robusta*, which is much more common today. Robusta is fast-fruiting and can grow at wider elevation range than arabica. It is more tolerant to diseases and frost and easier to grow so it is a lower-cost coffee bean. But low-cost rarely means high quality and robusta does not have the flavor the arabica produces—it is the coffee beans of choice of mass market coffees.

The most flavorful coffees grow at higher elevations at a slow rate in a cooler tropical climate. This limits the total yield, of course, and ups the price of the beans. Warmer, lower-level coffee plantations yield an inferior but much more abundant crop. Coffee roasters also blend arabica with the robusta to bring up the quality of less flavorful beans.

The coffee tree is very sensitive to frost and thrives only in tropical surroundings. Pickers harvest the cherry-red fruit from the shrub, they separate the bean from the pulp, dry it and ship it green to coffee merchants who roast and blend the different varieties for retailers.

Green coffee beans have no smell and keep indefinitely. The heat of the roasting process starts a complex chemical reaction which, by the time roasting is complete, produces about 800 different chemical compounds, most of which contribute to coffee's aroma and flavor. Roasting only takes a few minutes at temperatures ranging from 385°F (200°C) to 480°F (250°C). Slower roasting, however, is desirable. The slower the roast, the better and deeper the final flavor but it adds to the cost. Darker roasting brings out more bitterness and deeper flavor. In the U.S., the East Coast prefers lighter roasts than West Coast, and Europeans favor even darker roasts.

Of all the chemical compounds in a cup of coffee, the alkaloid *caffeine* is the best known and most important to coffee drinkers. It is less well-known that the lighter the roast, the higher the caffeine content, which means that the light American roasts are high in caffeine, while those soot-black Italian roasts are lower. However, don’t switch on this account—the difference is only 2 to 3 percent in caffeine between dark and light roasts. During the roasting process many of the chemicals

evaporate in the vapors and caffeine is one of them. The longer the beans roast, the more caffeine goes up the chimney.

An average 10-ounce (300-ml) cup of coffee has 175 milligrams of caffeine, a same-size cup of tea about 65, a cup of instant coffee about 95 milligrams. A 10-ounce (300-ml) cup of cocoa contains only 20 milligram of caffeine. For comparison, a 12-ounce (355-ml) can of cola has 50 milligrams.

More than just a drink

The whole process of grinding, brewing, waiting, pouring, and finally taking the first delightful sip of the freshly brewed coffee, including the anticipation that starts with the first aroma-rich sniff as the grinder begins to work at the beans, is a ritual for many. For a true coffee fan, it is comparable to a Chinese tea-drinking ceremony.

Arabs, for instance, have a centuries-old ceremony of coffee drinking, including pulverizing the black-roasted beans in a mortar. The Turks grind their beans in a tall brass coffee grinder (they call it *kahve degirmeni*). Maybe we would get more from our coffee breaks if we did more than pour the stale brew from the office coffee machine into a disposable plastic cup and sip it at our desks. Or, even worse, get the coffee from a machine.

Other countries have their coffee rituals, too. Each visitor to a corporate office in Brazil, for example, is served a tiny cup of dark, very strong brew, something similar to espresso but not quite as dark-roasted, freshly prepared by the secretary. She (almost always a she) brings as many of the little filled cups into the office as the number of people present. Everyone takes a cup (it would be an insult not to) and drains it in a two or three swallows. Sipping is impolite, too. The fresh coffee is always heavenly. The secretary is back in a minute to collect the cups and discretely disappears.

The ritual is the same when you arrive at an oil-drilling rig a hundred kilometers from the nearest Brazilian city, but instead of a secretary, the cook carefully brews the coffee, using a funnel-shaped cloth filter that he meticulously washes after each use. The coffee is as delicious, as scalding hot, as rich and jet black as in any city office, in spite of the primitive set-up and surroundings.

Italians drink their coffee most of the time as espresso or one of its close cousins. They drink many tiny cups a day, each freshly prepared, starting first thing in the morning.

The French drink espresso, too, but they prefer larger cups, roasts somewhat lighter than the soot-black Italian ones, and add hot milk. For breakfast, the French take their usually sweetened *café-au-lait* in a large bowl, like a two-handled cereal bowl. They pour it in the bowl and add small chunks of freshly-baked, crusty hard rolls or *brioche* just back from the bakery. The pieces of bread soak up the wonderful hot brew, turning the content that looks something like a hot coffee-based cereal mush, but taste nothing like any hot cereal you know, yet they eat it with a spoon, like we do oatmeal. When the bread pieces are gone, they sip any remaining coffee directly from the bowl. They also love their c*roissants* dunked into their coffee with similar affection.

Asians are mainly tea drinkers. The coffee they serve is mediocre by Western standards, even though coffee growing conditions are prime in the tropical parts of the Far and Middle East, especially in Indonesia. When they do drink coffee, it is weak and highly diluted with their favorite, sweetened condensed milk from a can. Exceptions are former French-occupied areas such as Vietnam where coffee is dark and strong.

In many places in Asia the brand name Nescafe is used interchangeably with the word coffee. When you order coffee in a restaurant in Malaysia, for instance, you will generally get Nescafe instant coffee with plenty of condensed milk already added. Even in private homes the

hostess is likely to serve Nescafe instead of the real stuff.

The British Isles used to be famous for serving rich, full-flavored teas, but their coffee was dishwater-colored, and the flavor mirrored the weak color, too. But in the 1980s the British slowly acquired a taste for full-bodied, aromatic coffees. Espressos and lattes have steadily made their way into the British lifestyle, too.

The Scandinavians, however, still maintain that the weaker the better. In many households, they percolate a large pot of thinly-flavored coffee in the morning, from which they sip cup after cup all day long.

My first cup of coffee experience in Sri Lanka was interesting. The coffee had an astonishingly spicy flavor, a combination of spices with a strong note of black pepper. Although the coffee was weak, the spices gave it a very unusual character, like the cardamom spice does to Arab coffees. I questioned a number of people but no one could explain why coffee tasted spicier in Sri Lanka than elsewhere. It always tasted that way, was the answer.

I revealed the reason accidentally and totally unexpectedly. I was watching a neighbor's cook prepare the evening curries. She used a large stone mortar size of a large round basket in diameter that sat on the ground in the yard and a huge wood-handled pestle as tall as she was. There were some half a dozen small bowls of spices sitting on the ground. She pounded each bowl of spice one after the other in the mortar, cleaning out the mortar after each with a quick wipe of a coir brush. The last item she crushed was coffee beans. Eureka! This was, then the source of the coffee's "spicy overtone."

The art of brewing coffee

How does a perfect cup of coffee happen? Three variables are responsible for its goodness—or badness. The single most important item is good and reasonably fresh coffee beans. What kind of coffee-making devise you use, the second variable, while important, is still somewhat secondary to the choice of beans. The third variable, of course, is water.

The best-brewed coffee comes from properly roasted, freshly-ground beans. You can even roast your own beans for the very freshest brew possible. Green coffee beans are available from some roasters. Home roasting, though fun, is quite cumbersome and, because the process is hard to control with home kitchen equipment, somewhat unpredictable. Roasting in a heavy sauté pan in small batches is one way, roasting in a hot oven is another. Stove top coffee roasters are just as awkward to use. And by the time the coffee beans are dark enough, there is enough smoke in your house to set off the smoke alarm—a good exhaust fan is essential when home roasting. If you don't have one, roast outside on a portable burner.

Storing coffee beans

Coffee beans are rich in oil, but the oil is inside the beans safely sealed from harmful oxygen. Roasting brings the oils to the surface where they become instantly susceptible to oxidation that slowly results in rancid beans. Even though it takes many months at room temperature before the oils turn rancid, they lose flavor well before rancidity sets in. Stored in an airtight container in the freezer, unground beans hold their flavor at least 6 months. If you are short of freezer space, refrigerator temperature slows deterioration well, too.

Grinding the beans exposes a much larger surface to the process of oxidation and speeds up staling. Storing coffee as beans is definitely preferable to storing it ground. If you prefer not to grind

your own, buy coffee in quantities that you use up within weeks, not months. And ground coffee definitely prefers to live in the freezer for good health.

Oxidation proceeds fastest at warmer temperatures. It slows down in your refrigerator and practically stops in the freezer. Of course, if you can eliminate oxygen from your coffee container, a vacuum pack for instance, the coffee becomes stable, even when ground.

To get the most from your coffee beans, grind them just before brewing. If using the grinder every time you want coffee is a hassle, grind a few days' supply and pop the extra in the freezer.

Using the correct amount of ground coffee is essential for the best brew that suits your palate. Even if you like your coffee weak, use a full measure of freshly ground beans which is one tablespoon per cup, and dilute the coffee with hot water. Cutting down on the amount of ground coffee cuts down much more on the flavor than diluting the final beverage with hot water does.

The right equipment

Virtually any coffee maker, no matter what brewing method it uses, will produce a good cup of coffee if you use it properly. The electric drip coffee maker has become the most popular in recent years with two major advantages—the method extracts the most flavor from the ground beans, and it produces coffee quickly. Both of these are important points to today's coffee drinkers who want their coffee full-bodied and strong but with the speed approaching the making of instant coffee. Electric drip makers are programmed to be fast because consumers refuse to buy a coffee maker that takes its time. Yet you cannot speed up properly-brewed coffee, like you cannot hurry the yeast in a rising bread dough. Even though electric drip makers make reasonably good coffee, they leave a lot of flavor in the grounds because of their speed. Manual drip makers, in which you pour the hot water over coffee beans in a filter are slower but extract more flavor.

The percolator, that popular device of the 1950s and 1960s, is a slow coffee-maker and produces a milder brew with much less body—the type of coffee most preferred in that era. But the American palate of the 1990s has become more sophisticated in choice of both foods and beverages. Fuller-flavored coffee is now in demand and percolators lost out—and good riddance.

The ideal contact time of water and coffee is two minutes at a water temperature of 200°F (94°C). For the amount of water, the drip coffee maker lets water through a little too fast. The percolator method passes boiling water through the ground coffee repeatedly for almost 15 minutes. Limiting the contact of coffee and hot but not boiling water to a short period of time extracts a different set of chemicals and provides more, fuller flavor.

If the water is too hot when contacts the coffee grounds (between 205º and 220°F, 97° to 100°C), too much acid is released, producing a slightly sour brew. If you don't like your coffee too acidic, adding milk or cream gives a smoother, somewhat milder beverage, as the cream combines with the tannic acid in the coffee toning down its astringency.

Espresso coffee machines, that Italians developed in the 1930s produce ideal brewing conditions, but instead of just hot water, a combination of steam and hot water pass through the coffee, extracting more of the essential chemicals that result in a small shot of very dark, very strong brew. Espresso, by the way, means "pressed out" in Italian. Besides the large and costly commercial espresso machines, we have a large choice of smaller electric models available to us for home use. You can even get a reasonably respectable espresso with a simple non-electric stove-top model. Many espresso machines produce an excellent cup of regular coffee if you let enough water pass over the grounds to give you a mugful.

To use the plunger-type coffee maker, you dump fine-ground coffee into the glass jar-like

container, pour boiling water over it and let steep for a few minutes. Then press the coffee grounds to the bottom of the pot with a piston-like plunger fitted with a filter, leaving the relatively clear coffee at the top ready to pour into the waiting cups. Maybe it is the feeling of control when you push the plunger that makes this method popular. It is certainly not the quality of the resulting coffee, though some people swear by it.

With a little practice, you can produce a wonderful coffee with nothing more than a simple pan on your kitchen stove. This is boiled (although you really don't boil it) or cowboy coffee. It takes patience but works fine if all else fails. I have used it on camping trips when we remembered the coffee but forgot the coffee pot. For cowboy coffee use fairly coarse-ground beans, start with cold water and coffee in the pot, and heat slowly to near simmer while carefully watching to make sure it never boils. Take the pot off the heat, sprinkle cold water on the surface (to help settle the grounds) and let it brew for a few minutes, a time period that also settles most of the coffee grounds.

Heating coffee till it boils changes its chemical composition, producing a bitter, slightly sour and cloudy beverage, so however you prepare coffee, don't allow the liquid to come to boil.

Reheating coffee is not a good idea, either. It simply doesn't taste very good. If you must, the least harmful method is to steam it with the steam nozzle of your espresso machine or with a separate milk steamer. If you don't have an espresso machine handy, dump the cold coffee out and start with a fresh brew. You deserve only the best.

Although some of the coffee makers are made of aluminum, avoid it if you can. Aluminum retains the leftover, stale coffee flavors the most and to get unaltered coffee flavor, you need to clean it thoroughly each time.

Water is water

The third player in a perfect cup of coffee is water, and it does make a difference what kind you use. Heavily chlorinated water gives an off flavor to your brew. Municipalities often add chorine to the water supply early in the morning. When you turn your faucet on at 6 a.m. to fill the coffee pot, you may get the water left in the pipes from the night before, which is relatively low in chemicals. But if it already smells like chlorine, don't use it in your coffee maker. Fill the coffee pot the night before, and most of the chlorine gas evaporates overnight.

But even worse than chlorinated tap water, as far as damaging the taste of the coffee is concerned, is water from the hot water tap. That water has been sitting in your water heater for a while, possibly days, ready for your shower. It is old and stale, with little oxygen in it. Save it for your shower, where only the temperature is important.

Guide to coffee drinks

Here is a brief guide to the common types of coffee drinks that you find in better coffee houses in the U.S. and Canada.

Name	Characteristics	Served
Espresso	Strong very dark-roasted coffee (Italian roast) made with espresso machine	Demitasse cup
Caffè Americano	Espresso tempered with hot water	Regular coffee cup
Cappuccino	Espresso with a little steamed milk and froth; may be garnished with a shake of cinnamon or cocoa	Regular coffee cup
Caffè Mocha	Espresso and froth from hot chocolate	Regular coffee cup
Caffè Latte	Espresso with a lot of steamed milk and froth	Tall glass
Machiato	Espresso and froth from steamed milk	Demitasse cup
Café au lait	Strong coffee (dark French roast) and steamed milk, about half and half	Regular coffee cup
Caffè borgia	Frothy caffè mocha with orange and lemon peels	Regular coffee cup
Caffè l'amore	Espresso with topping of gelati (Italian ice cream)	Demitasse cup
Turkish coffee	Made with very finely pulverized dark-roasted coffee in special Turkish brass coffee grinder—*kahve degirmeni*—ordinary grinders will not produce fine enough powder. Powder mixed with cold water (1 tbsp coffee in 1/3 cup water plus 2 tsp sugar) and brewed in a Turkish long-handled *cexve*	Demitasse cup
Greek coffee	Essentially the same as Turkish coffee	Tiny cup
Viennese coffee	2/3 strong moderately dark-roasted (Viennese roast) coffee and 1/3 hot milk	Regular coffee cup
Mocha	Melted chocolate, hot milk and coffee in the ratio of ¾ c milk, ¼ c coffee and 1 oz (30 g) semisweet chocolate, may be dusted with cinnamon or cocoa and served with whipped cream. Can be served chilled or over ice. Also called Brazilian chocolate	Regular coffee cup

You notice from the table that it is steamed milk, or its foam, that adds a zip to ordinary espresso. For a good steam you need a steamer that most espresso machines, even designed for home use, include as standard gear. Commercial espresso makers inject air along with steam through a steam wand or nozzle. Home espresso makers may also have a separate air injectors but even if yours doesn't, you can produce a perfectly satisfactory milk froth and steamed milk.

Caffè latte

If you have an espresso machine with a steam nozzle, latte is not difficult to make in your kitchen, even though most people prefer to have a latte in a cafe.

Ingredients

8 ounces (240 ml) non-fat or low-fat milk, well-chilled

2 ounces (60 ml) espresso, freshly brewed

Procedure

1. Open the steam nozzle of your espresso machine to clear any condensed water.

2. Create a good mousse on the cold milk in a small pitcher, keeping the steam nozzle just below the surface of the milk. Spoon the frothy mousse into a tall, heat-resistant glass. Froth more milk and add to the glass. Continue frothing until you have about a quarter glass-full of mousse. Now, with the nozzle deep down in the milk, steam it until very hot (150° to 170°F or 66° to 77°C), and slowly pour into the glass down the side without disturbing the froth.

3. Pour the freshly-brewed shot of espresso slowly into the glass down the side. The milk and espresso form two separate layers. Serve as is, or with an optional dusting of cinnamon or chocolate shavings over the froth.

Serves 1.

Proper steaming takes some skill that you can acquire with a little practice. The thick steamed milk foam they properly call the mousse. No-fat or low-fat milk steam the best and for good frothing, the milk should be very cold, just above freezing. The lower the fat content of the milk, the frothier the mousse it will build because fat interferes with the frothing process. Non-fat milk produces a stiff, dry mousse while low-fat milk a smoother, longer-lasting one.

Other forms of coffee

Many people who love coffee have become concerned about the detrimental effects of caffeine. The answer is decaffeinated coffee. Processors use two techniques to extract the caffeine. The first technique, using a solvent, is inexpensive and simple, but minor residual amounts of solvent remain in the coffee beans that bothers consumer advocates. And it may also bother you if you drink a lot of decaffeinated coffee. No one knows its long-term effect on the body.

The other technique is the Swiss water process, which is an involved and expensive method, using plain water as solvent. Repeated soaking and draining of the green coffee beans is effective to remove both the caffeine and some of the flavor compounds but there is no residual chemicals remaining, only the flavor suffers a little.

When you remove caffeine, you do lose some flavor with any method but coffee roasting and decaffeination have become such a science that modern decaffeinated coffees often taste nearly as good as their regular counterparts.

If you are concerned about caffeine, and also about the safety of the decaffeination process, a compromise may be a solution. Try blending regular and decaffeinated coffees at any ratio you feel is right for you.

Flavored coffees have also became popular, though serious coffee drinkers much prefer their coffee unadulterated. The roasters add liquid flavorings to the beans during or right after roasting. The ideal temperature to lock flavorings into the coffee beans is around 100°F (38°C). Because of their higher cost, generally they don't use natural flavorings. The imitation flavorings are of two types:

1. *Nature-identical*, which is synthetically produced chemical with the same composition as natural flavors.

2. *Artificial*, chemicals that mimic natural flavors but having different chemical

compositions.

To introduce the powerful flavoring agents uniformly into the coffee beans, roasters use a *carrier*—a neutral, non-toxic substance the flavoring agent is mixed with (often plain vegetable oil) in a similar role as alcohol has, for instance, in vanilla extract.

Go ahead and buy hazelnut or cinnamon coffee if you really enjoy the flavor, but be aware that you are adding still another chemical to your system, a fact that concerns many of us.

What about instant coffees? G. Washington, an Englishman who lived in Guatemala near the turn of the century, was the first to come up with the idea of truly instant coffee. He noticed a fine powder forming on the spout of the coffee pot as a precipitate from the coffee vapors. He collected the powder and to his great surprise, he discovered that he could make an instant coffee by dissolving it in hot water. He first marketed the idea in 1909 with obviously great success among people who want coffee but don't care about its flavor. Even though instant coffee has improved a great deal over the years, it is still only has one notable attribute—it is quick to make.

Coffee substitutes

Coffee is such an overwhelmingly essential commodity that during World War II, when shipments were blockaded and beans were very scarce in Europe, people had to look for substitutes. They used chicory root *(Cicoria entybus*) most commonly, especially in Germany and Central Europe where coffee beans were virtually non-existent. It made a poor substitute for real coffee lovers having no caffeine and only a vaguely-resembling coffee flavor, but it was still better than no coffee at all. Another substitute for coffee beans was dried and ground dandelion root. The resulting brew has a bitter, coffee-like flavor but, again, without the important alkaloid, caffeine.

But people in the Southeastern U.S. still prefer their coffee with a little chicory added, particularly in Louisiana. It adds a layer of pleasant bitterness, a flavor quality that comes through acquired taste.

Some people use a beverage called Postum, a supposed coffee substitute made from wheat, bran and molasses, has the color of coffee when you add hot water to it, but this is where the similarities end. The flavor does not even remotely resemble coffee.

TEA

Aside from water, tea enjoys the highest consumption of any liquid in the world. This may sound hard to believe but a large population of the world on the Asian continent are tea drinkers. It is unfortunate that we are not a nation of tea drinkers. Tea is a very refreshing, pleasant beverage that causes no harm to human physiology, even if you sip many cups during the course of a day.

In much of Asia untreated water carries harmful microorganisms, and is not safe to drink. Brewing it into tea kills all harmful bugs and turns it into a safe beverage, thus over the centuries tea-drinkers had a better health and better chance to survive.

Tea drinking in the world outside Asia is much less significant. Great Britain is the only exception. Tea has been virtually idolized there and most people demanded good-quality tea they properly brewed from loose tea leaves according to traditional rules and codes. Tea used to be taken very seriously in every social and economic level. In fact, tea brewing and drinking transcended social status. Tea bags were unknown. But in the last few decades or so, the British became very fond of good coffee, too, tea consumption declined and even tea bags and instant teas appeared.

On British construction crews, for example, there used to be a small designated tea pail in which the gopher of the crew boiled the tea-water on whatever fire he could build three times a work shift. He measured the amount of loose tea leaves that he added to the prescribed amount of fresh-boiled water. As soon as the tea brewed for the correct five minutes, everyone dropped his or her tools for a proper tea-break. The crew could fire the gopher for not knowing the exact tea-brewing protocol. Today that old-fashioned tea is likely to be a can of soft drink or a hot beverage from a styrofoam cup from a nearby vendor or machine.

In North America serious tea drinkers are definitely in the minority. Canadians are the exception, no doubt because of the English influence. French Canadians have also adopted this delightful custom. But even in Canada, the predominant hot beverage became coffee by the early 1980s.

Tea Facts

Tea does more than wet your whistle

There is an aura that surrounds the steeping of tea and relaxing with the resultant brew. For many, a ceremonial, totally relaxed, almost spiritual atmosphere surrounds tea drinking. This is especially true for the Chinese and Japanese.

Chinese tea drinking ceremonies were outlined in the years 700s with precise instructions in every aspect of tea brewing, from the plucking of the tea leaves to the brushing of the tea pot after use. The Japanese adopted tea drinking 500 years later in the 1200s and brought tea ceremonies to a new height with 37 steps to be followed precisely in a tea house. Not only the tea house is separate from the main house but even the construction of the tea house and the path leading to it have prescribed codes.

English high tea, though by no means as strictly controlled by tradition as an Oriental tea ceremony, was quite an experience for a visitor. Starched, snow-white damask linen tablecloths and napkins, gleaming silver tea pots, milk and sugar containers, translucent bone china, intricate silverware, candelabras, doilies, cucumber sandwiches, tiny tarts, toast with marmalade, canapés, fruit platters, and still more bite-size sandwiches with watercress and cream cheese. What a sight! And the ladies and gentlemen in correct attire for the occasion!

The term “high tea” is confusing to Americans, and today even the British disagree on its exact meaning. The term probably originated in Scotland and referred to a prosaic early supper, with accompanying tea. Afternoon tea was, and in some places still is, a fancy afternoon affair around 4 o’clock with fresh-brewed tea as the centerpieces, surrounded by the numerous dainty little items that so pleased the eyes.

In different British geographic areas the afternoon tea, or simply tea, meant different types of meals. More recent changes in working and family patterns further confused the term—changes that did not allow time for a social, more formal tea occasions. Canadians cashing in on the tourist trade confused the term still further as hotels in tourists areas introduced the pricey afternoon “high tea” concept that the British simply call *tea*—yet you must admit, *high tea* does sound better.

The English afternoon tea, though, is more an experience for the eyes than the taste buds. The flavor of most of the traditional sandwiches and canapés falls far short for today's more sophisticated and educated palates. The famous English buttery, crumbly tarts, thick marmalades with large citrus pieces, real thick Devonshire clotted cream, however, are always worth seeking out. Then there is the actual tea! No one can brew a better cup of tea than the English, but they also

demand, and willingly pay, for the best quality tea leaves expertly blended available anywhere.

With today's high-speed lifestyle, the tea ceremony in England and all over in Great Britain has lost much of its sparkle (and silver). Even the quality of the tea has suffered. You see store brand tea bags more and more in afternoon tea sessions. As in other parts of the world, inexpensive or even poor quality generic teas are taking the place of the more traditional high-quality leaves.

Even worse, instant tea has established a stronghold among English tea drinkers—the beginning of the end for the famed high tea ceremonies, perhaps.

Benefits of tea

Tea has health benefits beyond the pleasure of a soothing and refreshing hot or iced beverage. The tannin is thought to have beneficial effects in fighting tooth decay. Tea leaves also have a relatively high fluoride content, much of which ends up in the liquid after steeping. Fluoride strengthens tooth enamel, and research has shown that tea-drinking nations have better teeth than non-tea-drinking peoples. With fluoridization of the drinking water in most urban centers of the United States, that benefit is no longer as valuable. Today we drink tea for pure pleasure.

Interestingly enough tea leaves have high caffeine content, twice the amount of that in average coffee beans (in an amount needed to brew a cup of either tea or coffee). But the tea-steeping process doesn't extract the caffeine efficiently, so the final beverage contains only less than half the amount of caffeine that the same cup of coffee. Someone may yet come up with a process to brew espresso tea, that will hopefully give you an extra kick of caffeine.

Different types of tea leaves have differing amounts of caffeine. The lowest are the Chinese and Japanese green teas. Indonesian, Indian and Ceylon black teas have twice the amount of caffeine that green teas have. A few herbal teas, like South American *maté*, have high caffeine content, too. A cup of maté contains about as much caffeine as a cup of coffee.

Tea may be decaffeinated just like coffee and is readily available in this form in the U.S.

How people drink their tea

Tea drinking habits are as varied as the number of people who drink it. The English always offer sugar and freshly heated milk with tea, sometimes lemon wedges. Americans are far less particular. They don’t use cream or milk, but they expect sugar and lemon with their tea. Canadian tea drinking habits fall halfway between.

The traditional milk in tea may have a culinary reason. The protein in milk binds with the mouth-puckering tannin in tea and tempers its astringency, making it a much smoother beverage. Since the English brew their tea particularly strong and full-bodied, milk is a welcome addition that tames the astringency and smoothes the rough edges. American tea is milder, less astringent, the tannin content is lower and muting with milk is unnecessary.

In the Orient, especially in China and Japan where they use light, mild and dainty green tea predominantly, they add nothing to their tea. Elsewhere in tea-drinking Asia very hot regular black tea is the common beverage with plenty of sugar along with milk, canned evaporated milk or sweetened condensed milk. It is amazing how refreshing hot tea can be in these scorching, humid climates.

Russians love their tea strong and full-bodied, just like Brazilians love their coffee. The characteristic samovar with its little oil or candle heater to keep the tea hot testifies to the ritual and ceremony that goes along with tea drinking. Now, even the samovar has been electrified, losing the

charm and grace of a small live flame under the tea pot. The next step for the Russians, no doubt, is the tea bag with water heated in a microwave oven.

Before the modern tea bags Russian brewed a fresh pot of hot tea concentrate they served with a pot of plain boiling-hot water. You serve yourself to a little of the strong concentrate in your cup, then diluted with hot water to suit your taste.

Central Europeans sometimes add rum to their tea—just enough to flavor it. Tea with rum is especially welcome on a cold winter day, a tradition that matches American hot chocolate.

The worst place to find a properly-steeped cup of good tea is in almost any restaurant in North America. It is a rare restaurant that serves tea brewed with fresh boiling water. For instance, guests attending a conference in a large classy hotel anywhere in North America can help themselves to a reasonably good cup of coffee from a large shiny urn. Next to it is another equally shiny urn containing hot water, with tea bags on the side so you can steep your own. The water is far cooler than the required boiling temperature, probably stale to boot. It will never make a proper tea.

What's the solution? There isn’t a good one. It takes relatively little labor to brew 100 cups of coffee, and if they happen to use a good blend of beans, it is a good, drinkable coffee, still acceptable after standing for an hour. But tea must be brewed fresh with some basic know-how, and there is no automatic equipment available to do so. To brew a cup of tea individually takes far more labor and time than justified in a banquet hall or restaurant, considering how few people drink it. If you are a true tea lover, wait till you get home and brew your own.

Types of tea

There are only four basic types of tea: traditional black tea, green tea, oolong tea and herbal tea. All but herbal teas come from the tropical evergreen shrub that is the tea plant. The different types are the result of different processing not using different plant species. Herbal teas, on the other hand, come from a great variety of aromatic plants using either leaves, stems, seeds, fruits or roots.

The varieties of tea available to the consumer are staggering. Yet, most people, even serious tea drinkers, stick to a relatively few types or blends. Many people choose a brand name or a generic tea conveniently packaged in a tea bag for their occasional cup of tea. Others select their teas as carefully as connoisseurs choose their wines for a festive evening, and would rather drink plain hot water than use a tea bag to prepare their brew.

Where tea comes from

Our tea comes from the fresh green leaves of the tea plant, *Camellia sinensis*, a flowering tropical evergreen shrub in the Camellia family. Pickers pluck only the topmost, youngest leaves along with the bud that sits between two leaves. The many attempts to mechanize tea-leaf picking have not been successful, and tea-pickers still hand pick virtually all teas.

Depending on the season, temperature and amount of precipitation, the leaves of the tea plant may grow slower or faster. During the hot dry season growth is slow, and they pick the leaves less frequently, the flavor becomes more concentrated in each leaf, producing premium leaves. During the wet season, tea leaves grow quickly, the flavor is more diluted and the quality is poorer. Faster-growing lower-altitude teas are always lesser in quality than plants growing at higher altitudes, just as with the coffee berries.

The fresh-picked green leaves will not produce a satisfactory brew. The composition of the

leaf must be chemically altered before you can steep it into a good tea. For black tea, tea-processors first crush then heat the leaves to convert the original group of chemicals into aromatic molecules and tannin. This gives the tea its body and astringency. The next step, called fermentation in the tea trade, is not fermentation in a strict sense, because there is no microbial action in the process. The tea master steeps the leaves at 80°F (27°C) for several hours to develop the tannin and flavor. Then he dries the fermented leaves at a high temperature to reduce the moisture content. At this point the dried leaves are ready to be graded, blended, shipped and brewed.

Green teas skip one stage—fermentation. Instead, they go through steaming to destroy the enzymes that cause the leaves to continue maturing. This produces a thinner, paler drink with weaker body, less astringency and aroma, and a lower tannin and caffeine contents.

Oolong teas fall somewhere between black and green teas. The leaves undergo only brief fermentation, and the resulting brew is not as strong as black tea but not as mild and gentle as green tea.

People drank most herbal teas originally for their curative properties, but in recent decades they have also become popular as a soothing, relaxing hot beverage to replace coffee or regular tea for those who prefer a caffeine-free drink. Sometimes they brew the leaves, as in mint tea, or the fruit as in rose hip tea. Even roots as in fennel tea, flower petals as in marigold tea, and seeds as in angelica tea, may infuse into a pleasant-flavored, often calming, soothing, peaceful hot beverage.

Many herbal teas are too bland or too subtle by themselves, so blending several aromatic herbs adds complexity to the flavor and some heft to the body. Commercial herb teas are often blends of several types of herbs, or just one herb with the addition of flavoring, orange peel, for instance.

Commercially available black and green teas are also blends, sometimes of teas from many different growing regions. Blending is an art with twofold reasons. First, it allows a reasonably consistent quality and flavor year after year, even when adverse weather conditions or political incidents affect the availability of tea from some growing areas. If tea from a particular area is not available, the tea master may create new blends from other growers to approximate the flavor of the accustomed standard blend customers prefer.

The second reason is price. High-quality tea is expensive and too costly to use by itself for brewing, except by connoisseurs who are willing to pay the premium price. In commercial operations, they blend high-priced, high-quality teas with weaker, lower priced teas to bring their quality up to a more acceptable but still affordable level.

Tea planters always reserve a sack of tea from the slowest-growing, best crop of the year for their own use and as gifts for friends and visitors. This quality of tea is virtually unavailable to anyone else—the best of the best. I could not believe how incredibly good tea can be until I received a pound (half kilo) from one of those reserved private stock while visiting a Ceylonese tea planter. It has such a concentrated, intense flavor that you can brew a mere teaspoon of the tea leaves into a large pot of the most delicious tea you will ever taste.

Making a perfect cup of tea

There is little controversy over tea brewing techniques. The centuries-old English way gives you a perfect cup of tea every time. Clean, fresh water, a clean, preheated pot and good-quality tea are all that are essential. The water must be freshly boiling, but not boiled for any longer than necessary or it loses its oxygen content and becomes flat.

Always preheat the tea pot with boiling water, then add measured amounts of tea leaves into

the hot tea pot and lastly freshly boiling water. Preheating the pot keeps the water from cooling down any more than necessary. A tea cozy, a thick insulating material or cushioned metal cover that fits snugly over the tea pot, guarantees the least amount of heat loss during the steeping process.

Pour the water over the tea leaves (or tea bags) in the pot in the ratio of one teaspoon of leaves (or one tea bag) to each cup of water. Infuse the leaves (let them sit in the hot water) for 5 minutes. That's it.

Five minutes of steeping is an entirely arbitrary time that someone probably chose centuries ago, but it works. It allows time to steep the desirable quantity of aromatics and chemicals from the leaves. If you steep it for a much shorter period, the tea is not full-bodied. If you steep it longer, you extract too much tannin and the tea becomes bitter. Should you prefer a weaker tea, use fewer tea leaves but still let them steep for the full 5 minutes. Or dilute your tea with hot water after it has steeped.

Never use hot water from the tap. The water is stale because of its sojourn in the water heater, and it lacks oxygen. Not only will you get a flat-tasting tea but you may also add a small amount of lead in your system (if you have lead pipes in your house) because hot water dissolves lead more efficiently than cold water does.

Strain your tea with a fine tea strainer as you pour the tea from the pot to keep loose tea leaves out of your cup. Or you can put loose tea leaves in a tea ball, but it requires some stirring during steeping, as the tea ball restricts the contact of leaves with the hot water. Move the ball up and down a few times during steeping while holding it by its chain (or handle).

You infuse herbal teas somewhat differently. It takes longer, 10 to 20 minutes, with some herbs even hours, of simmering, to produce a flavorful beverage. Leaves give out their aromatics faster, roots and seeds much more slowly. You can use pulverized roots and seeds to speed up the brewing process, as it is in commercial herbal tea bags.

Other forms of tea

A chilled version, iced tea, is popular mainly in the United States and Canada, particularly during hot summer months. A real iced tea takes more effort, because once you make the hot tea, you needs to chill it. If you have lots of ice and have made a powerful brew, you can pour the hot tea concentrate right over ice cubes.

Most people prefer the easy way out—instant iced tea mixes, or more recently, cans and bottles of ready-made tea that you can store in the refrigerator. Unfortunately, these are generously presweetened. Again, if you are serious enough to demand a glass of good iced tea, wait till you get home and make your own.

A major problem with making fresh iced tea is cloudiness. Although the flavor doesn't change, pigments of tea and several chemical components precipitate in the chilled beverage. You can avoid this by starting with hot water (about 100° to 120°F or 38° to 50°C) rather than boiling water, adding the leaves, letting them steep for at least an hour, then straining the leaves off and chilling the beverage. Another way to do this is by making sun tea, a simple process of combining tea leaves and water and letting them brew in the sun for several hours.

Virtually any tea can produce a good iced tea, but iced green teas and herb teas make iced teas that are too mild to most taste. Herbs, however, add a pleasing flavor to regular iced tea. Mint is a particularly popular flavoring, though many herbs give you pleasant iced tea.

Britons despise iced tea. They feel that it is a truly American invention and sacrilegious to add ice to their national brew. Surprisingly, it was an Englishman who first created iced tea at the St.

Louis World's Fair in 1904. The heat wave that year gave iced tea an instant acceptance. It has gained in popularity steadily since then, though only within the borders of the United States and Canada.

If you are hopelessly addicted to life in the fast lane, instant teas are on the market, though a tea bag is virtually an instant tea, too. Contrary to what purists believe, quality tea bags produce a very good beverage. But you lose the little bit of ritual of tea brewing when you use a bag.

Storing tea

Tea leaves are not as sensitive to oxidation as coffee beans are. Tea leaves deteriorate slowly—their shelflife is measured in years. But they do absorb odors and outside flavors, as well as moisture from the air. Keep loose tea in a closed container, but there's no need to place it in the freezer or refrigerator.

COCOA

Like tea and coffee, the fruit from which we gain our incomparable chocolate, grows on a tropical plant. It is a small tree, *Theobroma cacao*, similar to the coffee tree or a more familiar small plum tree, and it grows in any hot tropical climate.

The cocoa tree originated in the Amazon Basin of South America and was carried north by various migrating groups. The Mayans who came to Yucatan around the year 600 may have established the first cultivated cocoa orchards there.

The Aztec Indians in Mexico had planted many cocoa plantations by the time the Spaniards conquered them. They used cocoa for religious and other ceremonial occasions. They roasted and dried the beans, then ground them into a fine powder and, to drink it, they whipped the powder into a frothy, bitter, oily beverage, either in cold water or in a fermented wine-like drink. Hot chili pepper and vanilla gave extra zip on very special occasions. It is a surprise that today no one attempted to revive these flavors and sell them in cans.

When the conquering Spaniards arrived, they were not much taken by this strange beverage. The conquerer, Cortez took the cocoa beans back to Spain anyway, along with the Aztec name, *cacahuatl* from which the word cacao and later chocolate derived. This chocolate beverage, unsweetened, high in oil and very unlike our present-day cocoa, still gained popularity in Europe during the next century because of its alluring flavor.

But it really took off when an inventive and creative Spanish cook served his own version sweetened with sugar and flavored with vanilla. Instant success! The Spanish continued to add new and exotic flavorings like orange flower, almonds, hazelnuts, anise, cinnamon and clove, and even musk flavor.

By the early 1600s, this wonderful sweetened beverage had spread to Italy, then France and England. It became a particularly hot item (pardon the pun) in England. The first cocoa house was opened in Oxford in 1650, then another one in London in 1657. During the 1700s, many more of these cocoa houses sprang up in England, France and Spain.

The early chocolate beverages were all hot chocolates, not hot cocoas. Is there a difference? Today even knowledgeable cooks and some cookbook authors use the two terms interchangeably. But they are not the same. Hot chocolate drink is from chocolate and hot cocoa is from cocoa. Until a Dutchman, van Houten discovered the process of converting high-fat

chocolate to lower-fat cocoa, the beverage was hot chocolate, even if they called their public establishments cocoa houses.

Cocoa Facts

Hot chocolate and hot cocoa

There is a tremendous variation of recipes for such simple preparations as hot chocolate and hot cocoa. Neither cookbook authors, nor manufacturers agree on a single and simple best recipe. Obviously, people have different ideas about what best is.

I looked through a number of old and new cookbooks, and the variety of methods and proportions are endless. The older the cookbook, the more complicated the method for preparation. Even the three major brands of American cocoa manufacturers—Hershey's, Nestlé's and Ghirardelli—suggest different methods on their cocoa boxes you find on market shelves though what is in their boxes are virtually identical.

The proper amount of cocoa to make an 8-ounce (320-ml) cup serving varies from 2 to 4 teaspoons. Most sources recommend 3 teaspoons. This gives a nice chocolatey beverage without an overpowering flavor and this is my favorite version (the recipe below uses 4 teaspoons cocoa but for a larger size cup).

The recommended amount of sugar varies even more, from 1½ to 6 teaspoons per standard cup. Obviously, this is much more a matter of taste than the variance in the amount of cocoa. One and one-half teaspoons of sugar produces a semisweet drink, 3 to 4 teaspoons produce a sweet cocoa, and 5 to 6 teaspoons produce a cloyingly sweet drink.

You can use any kind of milk to mix with the cocoa—no-fat, low-fat or whole. Some recipes suggest using boiling water, about a quarter of the total liquid, to mix the cocoa powder with before adding milk.

You can add other flavors to hot cocoa, too. A little vanilla, about ¼ to ½ teaspoon for 4 servings, adds a pleasing taste. A dash of salt sharpens the chocolate flavor. Older cookbooks suggest cinnamon, clove or nutmeg instead of vanilla, and some even recommend adding a little butter for extra richness.

Cookbooks don't agree on whether or not to cook the cocoa. Some experts suggest cooking it in water or milk first, so the starch in the cocoa loses its raw character. They claim that cooked hot cocoa has a richer flavor, and the cocoa powder is less apt to settle to the bottom of the cup.

Hershey's suggests boiling the cocoa in a little water for two minutes before adding the milk and heating the mixture. Older recipes also suggest cooking the cocoa first. The other two major cocoa manufacturers recommend no cooking, just adding hot milk.

Cooking makes sense using the logic that cooking the starch can only improve flavor. But my own experiments proved otherwise. Not only cocoa prepared by the uncooked method is easier (one less step to do), but it produces a virtually identical drink. I could detect no difference in taste. Even more surprising, the settling of the cocoa powder to the bottom of the cup was slower in the uncooked cocoa than in the cooked. I cannot explain the reason, but you can take my word for it. Possibly in the cooked version the starch or cocoa particles swelled with added water, became heavier and sank to the bottom faster.

Instant cocoa is a very popular product simply because of its convenience, just like instant coffee. The manufacturer adds an emulsifier, called *lecithin*, to help separate the tiny cocoa particles so that they will disperse easily and instantly in liquid. The sugar content of these ready-mixes is

very high, up to 70 percent by weight, while the actual cocoa content is low to keep the price down. They offer an inexpensive and quick way to make hot cocoa, or rather a cocoa-flavored drink. For a good cup of hot cocoa you still have to expend some energy and make your own.

Real hot cocoa

Hot cocoa from pure cocoa powder is easy to make with a blender or in a small bowl of a food processor. The mechanical action quickly disperses the fine powder in the liquid without lumps. This is more difficult when hand mixing. Unless you make a fine, smooth paste first, you end up with clumps of undispersed cocoa powder floating in the liquid.

Adjust the amount of sugar in this recipe to suit your sweet tooth. This recipe makes a semi-sweet hot cocoa.

Ingredients
4 teaspoons pure cocoa powder
1 tablespoon sugar
10 ounces (300 ml) milk, heated to near boiling
¼ teaspoon vanilla extract

Procedure
1. In a small bowl, mix cocoa and sugar. Add milk a teaspoon at a time and stir constantly with a spoon or small wire whip until you have a smooth, velvety paste, thick as heavy cream. Continue adding milk to thin the paste more, then stir all the milk into it.
2. Add vanilla extract, stir and serve.
Serves 1.

Real hot chocolate

Hot chocolate is considerably richer then hot cocoa with a much higher fat content. Make both as an experiment using this and the recipe above, compare their flavors and decide which one is for you.

Ingredients
½ ounce (15 g) unsweetened baking chocolate
1 tablespoon sugar
10 ounces (300 ml) milk
¼ teaspoon vanilla extract

Procedure
1. Heat milk, baking chocolate and sugar over medium heat in a small, heavy pan, stirring frequently until the chocolate is melted and milk is very hot. Turn heat low and simmer for 2 minutes, stirring, for a smooth hot chocolate.
2. Stir in vanilla extract and serve.
Serves 1.

The international scene

Americans and Canadians like to add tiny marshmallows to hot cocoa or hot chocolate, sometimes a cinnamon stick candy to make a fancy hot beverage, particularly for children. The French prefer milk and cream in varying proportions for an extra rich beverage. The Austrians use milk with whipped cream on top. In Russia and Brazil, they add coffee to hot cocoa to make mocha. And in Mexico, cinnamon is the accepted standard. In fact, Mexicans love hot chocolate with cinnamon so much that chocolate bars intended for hot chocolate come with added cinnamon.

Mexicans even have a special kitchen tool, called *molinillo*, to prepare a cup of frothy hot chocolate. This is a ridged cylinder-shaped wooden (now plastic) stirrer with a long handle that looks just like a lemon reamer. They put the thick lower portion of the *molinillo* into the hot chocolate and rotate it back and forth by rolling the handle between the palms of the hands, whipping the hot liquid into a froth.

Points to Remember

- For good coffee you need premium coffee beans and fresh, cold, clean water. Use any coffee maker that satisfies your taste buds.
- Store both whole and ground coffee beans in the freezer or refrigerator to slow oxidation of coffee oil and staling. Grind coffee beans just before brewing, if possible. If you buy ground coffee, buy in small amounts.
- For best coffee, use full measure of 1 tablespoon coffee per cup. If you like coffee weaker, dilute brewed coffee with hot water.
- Reheated coffee loses a lot of flavor. If you must reheat, use a steamer nozzle of a steamer or espresso machine to steam-heat it.
- Avoid flavored coffees if you want to avoid additional chemicals in your body.
- Use very cold no-fat or low-fat milk for building good froth with your steam nozzle.
- Use high-quality tea for a good cup. Steeping tea with loose leaves maintains the essence of tea rituals but good-quality tea also comes in tea bags.
- For best flavor use full measure of 1 teaspoon of tea per cup, steeped for 5 minutes. If you like your tea weaker, dilute with hot water instead of using less tea or shorter steeping time.
- Milk and chocolate make hot chocolate, milk and cocoa make hot cocoa. The two terms are not the same. Hot chocolate has considerably higher fat content than hot cocoa.

FLAVORING FOOD

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Fennel seeds
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When our not-very-finicky ancestors foraged for food in the wild, they picked whatever edible stuff they could find, and supplemented it with hunting and fishing. The art of preparing food was pretty basic. But once they figured out how to start their own fire instead of waiting for lightning to strike, incipient cookery and kitchen science came to life. It was limited to roasting meat and fish, which was an enormous improvement over eating them raw. It is not likely they used any spices and herbs in their incipient stone-age cuisine.

Raw fruits, vegetables, seeds and nuts didn't need much improvement. They were freshly picked at the peak of their ripeness, much fresher than the ones we get even at our local farmers' markets today. But in the beginning, humans fed themselves strictly for survival purposes, not for any hedonistic pleasures such as accenting flavors. They tuned in to whether the food was edible, inedible or poisonous. That is, after all, the primary purpose of our taste buds.

Once humans developed agriculture about 10,000 years ago, food became more and more readily available, and staple foods like rice, wheat, potato and corn inevitably became part of the primitive daily menu. These foods became basic staples because they were easy to grow, kept hunger at bay and were reasonably nutritious—but they were pretty bland by themselves. That is when spices and herbs came into widespread and universal use.

The Mysterious World of Flavorings

The spices of life

Herbs, spices and other flavorings actually served two distinct purposes in the primitive diet: to flavor and add variety to the staple foods, and to cover the off-flavored, sometimes even spoiled taste of foods that were no longer fresh but had to be eaten because it was better than going hungry. This was particularly true in warm climates where, without refrigeration, food spoiled quickly. Warm-climate cuisines today still use the spiciest flavorings, a tradition that goes back to the beginnings of the art of cookery.

Today in our modern high-tech world seasonings offer variety and flavoring to foods. While we have managed to eliminate the need to hide off-flavors of stale food with spices, industrial and restaurant kitchens have found another use for them. They use flavorings to boost flavor in otherwise flavorless second and third-rate kitchen products. Some spices with preservative qualities even add to the length of shelflife—so food processors like to use them liberally.

Whatever the reason, spices, herbs and flavorings play an important part in every kitchen, even in those where the “cook” does little more than boil water, toasts bread and pops prepackaged meals into the microwave. Food scientists today know over 1,000 natural flavoring substances, though in our kitchens worldwide we only use about 100. Each specific cuisine has a mere small handful of perhaps half a dozen, but rarely more than eight or ten, in common use. Only the most sophisticated cook with international repertoire has spices and herbs by the scores.

But the absolute masters of flavorings are the Asian Indian cooks who regularly use the largest numbers of spices and herbs. They combine them in infinite variations to obtain limitless shades of flavorings and they consider colors as carefully as flavors. The combinations must be pleasing not only to the palate but to the eyes. Indian cooks paint with their spices. Each Indian region, even each village or household, has its own characteristic flavor combination, like

Mexicans have their boundless number of local chili varieties.

Cooks around the world today commonly use about 30 fruits and seeds as spices for flavoring or coloring and about 30 aromatic leaves and flowers as herbs. Almost all flavorings are of vegetable origin, only a few come from animals. (A glandular secretion of the northern beaver, for example, is a chewing gum flavoring, while beeswax in honey is a flavor enhancer.)

Flavoring basics

Natural foods range from one end of the taste spectrum to the other: unflavored or mild foods on one end, like cereal grains, most meats, fish, poultry and milk; moderately flavored, such as fruits and vegetables, nuts and seeds; and on the highly flavored end garlic, onion, herbs, spices, coffee and cocoa. In most cases natural organic compounds called *aromatic essential oils* that occur in food plants give flavorful foods their powerful taste impact. Just put a light dusting of cinnamon on your tongue and you understand flavor impact. If you want to know the true meaning of the term, dust a little hot ground chili on your tongue. You get a very powerful flavor (and pain) impact.

Essential oils, also called *volatile oils* or *aromatics*, are responsible for the characteristic flavor and odor of a particular plant or seed. Each essential oil of an herb or spice is actually a collection of several organic ingredients from just a few in some to a couple of dozen in others. The essential oil of black pepper, for instance, has 23 organic components. Together, these 23 chemicals, not unlike the ensemble of individual instruments in a symphony orchestra, give our taste buds a characteristic taste sensation that translates in the brain stem to a flavor that we instantly recognize as black pepper.

TASTINGS Example of Essential Oils in Rosemary

Chemical Compound	% of Total Essential Oil
-pinene	<1%
camphene	<1%
cineole	17-30%
borneole	6-20%
camphore	10%
bornyl acetate	2-7%
terpineol	<1%
verbenone	<1%

Although its impact can be powerful, the essential oil is a very small part of the plant, often making up only 0.2 to 1 percent of the total weight. The essential oils are within the cell walls. To release the oils, you have to break the cell walls. Crushing an herb or grinding a spice does exactly that. Heat intensifies the flavor and aroma as it drives more of the oils out of the cell walls. Nearly all herbs and spices need this application of heat before they fully release their aromatic components but there are exceptions. For example, cinnamon sprinkled on your rice pudding gives full flavor impact without any heat.

Spices contain a more concentration of volatile chemicals than herbs. Spices are hard-stemmed plants and often it is their seeds that contain the flavorings. Some spices, on the other hand, can come from the root, as in horseradish, rhizome as in ginger, bark as in cinnamon, seed as

in mustard, fruit as in nutmeg or flower bud as in saffron. Soft-stemmed aromatic plants are generally our herbs. Any soft part of the plant that grows above ground may be the aromatic part and, like for seeds, the essential oil protects the plant against the insects world.

> **TASTINGS Americans prefer them spicier**
> The annual spice and herb consumption in the U.S. gained steadily since the mid-1970s. The new generation definitely prefers not only spicier foods but hot spicy foods. The combined total from the hot spices, chilies and black peppers represent one-third of the total spice consumption in the U.S. in mid-1990s. One reason for the increase is the popularity of three hot cuisines, Mexican (particularly Tex-Mex), Cajun and Thai. Another reason is the large Mexican and Asian immigration. Cumin seeds, turmeric, dill seeds and fennel seeds are also gaining significantly. The most popular herbs are cilantro, basil, oregano, thyme, rosemary, tarragon, mint, dill and parsley.

The concentration of volatile chemicals is so high in spices that chewing on a single spice totally overpowers our taste buds and the overall sensation is pretty unpleasant. Chew on a whole clove, a piece of ginger or a vanilla bean to get the idea. Even the more gentle herbs pack a lot of power. Try a few sprigs of the mild-flavored parsley. Eaten by itself it is a totally disagreeable taste sensation.

Where do flavors come from?

Many flavors in our basic foods develop only after some kind of chemical or physical manipulations of either flavorless food or food whose original flavor is completely different. These processes are what we collectively call cooking, and include boiling, baking, frying, roasting, dehydrating, curing and fermenting. Consider raw chicken. Have you even been hungry enough to eat it? It is bland as raw potato. It needs heat to develop the chicken flavor. Another example is a mild, almost bland cucumber. Cure it or ferment it, and it becomes a wonderfully tasty pickle, packed with innumerable new flavor compounds. Some of the flavor comes from the curing solution, some from the action of the microorganisms in the air.

The particularly complex roasted coffee bean may contain thousands of chemicals, although a mere 800 have been identified so far. Fewer than 100 of these contribute to the flavor. The science of flavors and the study of flavor compounds is still relatively new. In the 1960s the number of known flavoring chemicals was in the hundreds. In the 1990s flavor scientists have a list of over 6,000, many of them synthetic!

How our prepared foods flavored

Industrial cooks and food scientists in food processing and packaging companies very seldom use real spices and herbs as we do. When they need to flavor, say, a ton of sausage, the amount in fresh or dried spices and herbs they need is too bulky to store and handle. It is much more practical to use a few tablespoons of a highly concentrated form of those flavorings. Not only more practical but they keep fresh-tasting and useable for years while herbs and spices, fresh or dried, go stale in storage.

These flavor concentrates come in two forms—essential oils, which we already know from

our discussion above and *oleoresins*.

Oleoresins are also natural concentrates of flavors from aromatic plants, but they are even more complete than essential oils. They don't only include the characteristic odors and flavors as essential oils do, but also pigments, pungent constituents and natural antioxidants all of which make up the total flavor. In many aromatic plants, the difference in flavor between essential oil and oleoresin is not significant, but for a few, the oleoresin gives a closer duplication of the true flavor of that particular spice or herb.

How concentrated flavors are made

A process called steam distillation extracts all the essential oils of an aromatic plant. The process is simple. They slowly heat the plant and they drive off the volatile essential oils before the moisture evaporates. They collect these volatilized oils, now in vapor form, in cold copper tubes where they condense.

Most essential oils look like any other cooking oil, but they have a wide range of colors and very intense scents. You can obtain essential oils yourself by simmering tons of the raw herbs in water in huge vats. Eventually the oil rises to the surface that you skim off as essential oil.

They get oleoresins by a completely different process using solvents. The chemists dissolve all flavor components, they remove the solvent, and end up with the highly concentrated oleoresin, a viscous, resinous substance that looks something like melted candle wax. Starting off with 300 pounds (or 300 kg) of fresh rosemary, for example, you end up with 5½ pounds (or 5½ kg) of rosemary oleoresin.

Using essential oils and oleoresins does cause one major problem. They are so highly concentrated that the small amount an industrial recipe calls for must be precisely measured. In measuring such small amount even a tiny error could ruin an entire batch of food. Just image trying to mix a quarter cup of a concentrate in a ton of sausage meat. Uniform mixing of such a tiny quantity is very difficult. To solve the problem, the processors of these concentrates dilute them in an edible solvent or spray them on some kind of dry, neutral powder like salt, sugar, flour, corn syrup solids or dextrose (glucose). That way the sausage maker mixes, for instance, two pounds (1 kg) of a powder instead of a quarter cup.

The Mysterious World of Food Enhancers

What are food enhancers

Food enhancers are either naturally occurring or artificially produced organic substances that enhance and modify the flavor of foods. We rarely use any in our kitchens, yet we eat them all the time—they are in most processed foods we buy in the grocery store or eat in restaurants. But they also occur naturally in many fruits and vegetables, meats, dairy.

The branch of science that studies food enhancers is new but the impact of enhancers on our foods is so great that they are here to stay. So new that even the terminology is confusing. Food enhancers by some scientists are called food potentiators but the distinction between it and enhancer is unclear. I just stay with the term *enhancer*. Food enhancers are not much mentioned in everyday life, never mentioned in food commercials or acclaimed on processed food labels—food processors are usually not open to discuss them or refer to them because of possible adverse public reaction, generally negative to food additives, even if supposedly perfectly harmless and natural.

Monosodium glutamate, that we know popularly as MSG, is the only food enhancer most of us have even heard about. Though the science of food enhancing is quite new, the conscious use of MSG goes back many centuries in Oriental cuisines.

How do food enhancers work? We don't know for sure, but we are learning more about them all the time. Scientists now believe that a reaction between the food enhancer and certain chemicals in foods alters our *perception* of the taste. In other words, the flavor of the food does not *change* at all. Only our *perception* of the taste changes, the message the taste buds send to the brain.

MSG

Japanese and Chinese cooks have used MSG for centuries. It is a natural substance that is part of many basic foods, including mushrooms, tomatoes, human milk, cauliflower, carrots, celery and seaweed—all of them very flavorful foods. In the Orient MSG was first extracted from seaweed, and, after discovering its effect on flavor, introduced it extensively in cooking.

MSG, whether natural occurs in food or you add it, accentuates or sharpens the flavors. In addition to this curious effect, MSG also prevents flavors from fading—a most desirable characteristic for prepared foods for which processors want to extend shelf life without staling the flavors. Foods with MSG give you a pleasant mouth feel, the sensation of satisfaction, richness and fullness. It also reduces your perception of the sharp, unpleasant edge of onion taste, the earthiness of potatoes, the bitterness of some vegetables and it generates an agreeable meaty flavor. A small amount of MSG creates the perception of saltiness in foods, so much so, that processors can reduce salt by up to 30 percent and not lose the satisfying salty flavor. This is particularly useful for people on low-sodium diets.

Ready for a kitchen experiment? Cook a favorite chicken, vegetable or meat stock. When you are ready to serve it, divide it into two pots. Stir the amount recommended by the MSG package into one pot (1½ teaspoons per gallon or 4 liters of food), then cook both for another minute. Give your guinea pig guests or family a blind tasting of each and ask them if they can detect a difference. When I tried this, the portion with MSG had a significantly better, sharper, smoother flavor to all my tasters.

If you are dead set against adding anything artificial to your pot but want to enhance the flavor, use soy or tamari sauces which are both naturally high in MSG. Mushrooms, mushroom concentrates and powders do the same thanks to their high MSG. You will not have the full flavor enhancement effect, as you would with MSG, but it will be noticeable. The food industry uses these two sauces in many products as flavor boosters, even chocolate and ice cream, and can legally call them "natural."

The so-called "Chinese Restaurant Syndrome," a tightness in the chest, pressure in the head and behind the eyes, is a reaction some people get from eating in Chinese restaurants. They originally blamed it on MSG in the food. If MSG is the culprit in this syndrome, it is because an overzealous cook used too much (the old if-a-little-is-good-more-is-better rule). Scientists are still studying what causes this reaction to Chinese food, but the most recent suspect is some other substance that commonly occurs in the food, or even the air in Chinese restaurants. They don't believe it is MSG.

It takes very little MSG to produce a powerful effect. The label on Accent, a commercial MSG product available in the supermarket, recommends 1½ teaspoons to one gallon or 4 liters of food, which translates to only 0.2 percent of the total weight, about the same as the amount of salt you would use in a stew or soup stock.

Other food enhancers

There are several other known natural organic chemicals in our foods that also enhance flavor. These are much more powerful in their effect than MSG, anywhere from 15 to 100 times more. The food industry uses two of these extensively. Food scientists in the late 1990s are testing another dozen for similar use. They are particularly useful in today's processed foods when the demand for lower fat forced processors to remove not only fat but a portion of both the flavor and the mouth feel. Food enhancers may fill the gap.

The two in wide use are *IMP* (short for *5'-inosine monophosphate*) and *GMP* (short for *5'-guanosine monophosphate*). (For those fanatics who are not organic chemists but want to be correct in pronouncing these chemicals, the 5' in the name is pronounced "five prime"). Study some food labels on cans and packages on your shelf and you will find names like 5'-inosinate, 5'-guanylate, disodium inosinate, disodium guanylate, inosinate and guanylate. These are variations on the names for the same two enhancers, IMP and GMP.

TASTINGS Where they come from

IMP and GMP are now synthesized chemically, but they still extract MSG from raw food material—sugar beets, corn and wheat gluten—through natural fermentation.

The Japanese first extracted IMP from dried bonito, a Pacific tuna, in the early 1900s, but no one used it as an enhancer until the 1970s. GMP was first identified and extracted from Oriental black fungus, a mushroom, in the 1960s. Both substances occur in tiny amounts in many other foods—seafood, meats, poultry, dairy, vegetables, fruits. IMP is particularly prevalent in many ocean fish, pork and beef. Mushrooms contain a lot of GMP in addition to their high MSG content.

Each of these enhancers triggers different responses from our taste buds. IMP enhance salty flavors and GMP sweet flavors, as well as suppressing undesirable off-flavors. Processors often use them in various combinations with MSG.

TASTINGS Food enhancers in hot dogs

Here is an example of how much food enhancers meat packers use in a 20-pound batch of hot dogs. They may add one or several of these four. Depending on which they chose, the perception of flavor (not the flavor itself) will be a little different. The amount they add varies quite a bit, but the degree of flavor enhancement is about equivalent:

MSG	30 grams (7½ teaspoons)
IMP	1.5 grams (1/3 teaspoon)
GMP	0.6 grams (0.2 teaspoon)
I+G (50-50 mix of IMP and GMP)	0.9 grams (¼ teaspoon)

Maltol and *ethylmaltol* are two organic enhancers that processors use to enhance sweetness in commercially produced food, particularly fruit juices. At a lower level of only 50 parts per million (0.00005%) they enhance sweetness so much that processors can reduce sugar by 15 percent and you still perceive the same sweetness. At a level of 500 parts per million (0.0005%) you perceive a smooth mouthfeel when eating food containing these enhancers. (Maltol is one of the

chemicals that results from browning action when you roast meat, bake pastries or toast bread.)

Another enhancer, *sodium dioctylsulphonate* gives the perception of freshness in heat-treated milk to compensate for the flat, cooked taste. The enhancer *N,N'-di-o-tolylethylene diamine* produces the sensation of a buttery flavor in margarine.

Other ways flavors change

Some natural flavors can mask other flavors. For instance, sugar masks fruit flavors. A salty flavor masks the bitter taste. Masking flavors can be physically, too. Gums or starches used to thicken a food slow down the movement of flavor chemicals in your mouth, so the taste reaches your taste buds more slowly and with less intensity. Hot foods taste spicier and cold foods blander simply because the volatile components escape faster or slower, respectively, to reach your taste buds in hot foods.

> **TASTINGS Can you recognize flavors?**
> Some people have an amazing capacity to recognize the components of any food they eat. These rare people can recreate the component of a meal they have just eaten in a restaurant with reasonable accuracy. Others have no idea what they are chewing, familiar though the flavor may be.

A chemical action can also mask flavors. For instance, starch and protein mask some of the flavor components of meat. The chemical binding of these flavors makes them less likely to reach the taste buds of the person eating that food—that tones down the true, full flavor.

How fast a flavor reaches the taste buds on our tongues determines the flavor intensity of what we eat. In fatty foods the taste comes to us gradually and remains in our mouths longer because fats act as insulators. Low-fat foods don't have this insulating effect. The taster receives an unaccustomed quick but short-term flavor jolt. This has become a real problem for researchers as consumers demand more and more low-fat foods with good flavor. Scientists are searching for substances they can add to low-fat foods that mimic the insulating effect of fats, such as natural gums, so the flavor of food travels more slowly to the taste buds and stays in the mouth longer.

Is salt a flavoring agent?

Strictly speaking, salt is not a flavoring agent, yet it certainly enhances or sharpens the flavor of any food (even coffee). It is the only flavoring that is essential to our health.

Salt is a simple chemical that comes in a variety of crystal forms. Cookbooks sometimes recommend some salts as stronger or sharper than others. Many recipes you read today specify sea salt, for example. Is there really a difference between salt and salt? No. Salt, no matter where it comes from or what shape it is in, is simply a chemical with a strict and unvarying chemical formula, NaCl or sodium chloride. It is true that some types of table salt include minute amounts of other salts or minerals. But 99.9 percent of it is still just plain salt. The sea salt fad originates from the idea of being “natural”. But salt they mine in a salt mine comes from the same source, the sea and it is no less or more natural.

In the table below you notice that some salt comes in different shapes and sizes. Our taste buds perceive the saltiness differently if the size and shape of the salt crystals differ. But for cooking, once the cook adds the salt to the food and dissolves it, the original shape and size of the

crystal do not matter theleast bit. Stick to regular salt and spend the money you save on good-quality spices and herbs.

The table that follows lists the specialty salts.

Specialty Salts

Type	Shape	Comments
Pickling salt	Super fine	Has no additives
Kosher salt	Coarse crystals	Has no additives
Rock salt	Unrefined and chunky	A big bunch of crystals grown together
Sea salt	A little coarser than table salt	Comes both plain and with additives
Flaked salt	Simple salt but crystals mechanically flattened	Expensive—the larger surface area allows it to dissolve faster
English sea salt (Maldon)	A little coarser than table salt	Just plain NaCl in spite of its high price

Tasting

How we taste food?

We have a collection of tiny sensing organs on our tongues, called taste buds. A large number of nerves lead from the taste buds to the brain, sending instant messages as soon as we put something in our mouth. Our olfactory (smelling) organs and taste buds work together to allow us to taste food. When you catch a cold and your nasal passages are filled, the odor of the food cannot reach your mouth. Even though your tasting organs are fully operational, food seems to have no flavor.

Here is an example of how the nose and mouth work together to provide enjoyment of our food. You are eating popcorn. As soon as the popcorn gets close to your mouth, your smelling organs detect the odor through your nose. They send the brain a brief but rapid memo that popcorn is on the way. As the popcorn enters your mouth and you start to chew it, a different set of odors, activated by saliva, travel up into your nose. Now the brain receives a full report of what the popcorn tastes like, whether it is like what the initial memo from its aroma promised, or perhaps someone grossly oversalted it, and it falls far short of the promised, expected and acceptable flavor.

Taste is innate, we are born with it—we know as babies what tastes we like, what we dislike, what we detest. But smell is a learned sense, something that we acquire only with experience. We develop our likes and dislikes early, and any novel smell in life is a suspect to us. That is why most people are somewhat reluctant to try new foods that smell new and unknown to them.

Wetted food always emits a different and fuller set of aromas than dry food. As a matter of fact, if food is completely dry, it has no odor. Dried fruit has very little scent. But soak in hot water for a few minutes to rehydrate is, and its aroma increases many times.

Texture also contributes a great deal to the overall feeling of taste but only indirectly. Food textures range from velvety and creamy to crunchy, grainy, coarse and chewy. If the texture is

pleasing to you, you readily accept a good flavor. If the texture is unexpected for that food, or simply not pleasant to you, you may reject the flavor, even though it is otherwise a pleasing flavor. Let's suppose someone soaked and mashed the same popcorn in the previous example like mashed potatoes. Its flavor (and possibly its smell) did not change, but as soon as you bite into its unexpected texture, you taste buds reject it as inedible, and your brain instructs you to spit it out in disgust at once.

The temperature of a food affects our perception of flavors, too. Empty a can of beer in a saucepan and heat it. Serve it in coffee mug for a new taste sensation. Yuck! Or heat a crisp salad in the microwave just until it is nice and hot and serve it to your guests as a first course. Its taste is strange and unappealing, yet the flavorings altered very little in either the beer or the salad.

Even color and sound affect our sense of taste. Put green food color in milk and see if you can still drink it. In the Caribbean punishment dinner for misbehaved children is warm milk that their mothers mix with puréed green vegetables. What a horrid experience! The sound of crunching on food must be predictable, too. If the expected crisp-crunchy sound is gone from the potato chips because you steamed them before serving, they also taste entirely different to you even if the flavors remain the same.

Finally, our physical and mental states affect our food tasting immensely. Just think about what dinner tastes like after an awful day at work, followed by a bad scene with your son. You may feel hunger pangs, but even a great meal doesn't taste right. This is also true when you have a physical problem. But the opposite is true when you are experiencing a spiritual or mental high. Remember the hot dog at a good ball game? It tastes much better than that same flavorless, greasy hot dog does at the boring company picnic or at home. Almost any meal taste great following a good hike or other enjoyable physical activity, or even after an uplifting mental or spiritual experience.

Basic flavors: four plus one

Since 1864, when scientists first presented the concept of how we taste things, they believed we perceive four flavors: sweet, sour, salty and bitter. A different set of taste buds has the responsibility for each of these basic flavors. The four sets of taste buds effect each other and work together, not unlike the four voices in a barbershop quartet, and they send a single message to the brain about the *overall* flavor of the food that you happen to be nibbling on. For instance, in the overall taste, a sweet flavor reduces the sensation of bitter and sour tastes, a sour flavor reduces any bitter taste and increases the perception of saltiness, and salty foods reduce the sense of sourness and increase the sense of sweetness.

When you blend foods with several flavors, the result may be a pleasant or unpleasant taste sensation. When it is a pleasant blend we call the food mix having a pleasing taste balance. Some spices form a favorable taste balance, others clash with each other. For instance, two spices together in both Indian and Mexican cuisines are cumin and coriander seeds. They form a good taste balance and they use these two together often. When you blend together two or more spices, the blend mutes and softens the individual spice flavors. A good example is curry powder in which you grind a number of strong-flavored spices together, yet curry powder is not a forcefully aggressive spice blend.

Another curious character of tastes happens when they follow each other instead of in blend. In some Chinese cuisines the cook offers a barely-sweetened dish after a spicy course to cleanse the palate. The slightly-sweetened dish tastes more sweet to the eaters after the spice-laden dish.

In addition to the four basic flavors food scientists in the mid-1980s developed a strong argument in favor of a fifth flavor, *umami*. It is a Japanese word that means *deliciousness*. Umami, the flavor of the food enhancer MSG, is a flavor that cannot be classified into any of the four basic flavors. You can experience this basic flavor yourself by sprinkling a few grains of MSG on your tongue. Don't expect anything "delicious". In such high concentration not even the best chocolate flavor is delicious, but you will get the idea. Many flavor scientists now accept that we have at least these five basic flavors that most of us can taste.

In addition to these five tastes, there are others which are not primary flavors in the strict sense, yet we cannot ignore them because they are distinctive and they are there. Think of such tastes as spicy, metallic and astringent—flavor scientists yet to figure out how to deal with them.

Flavorings and Enhancers in the Kitchen

Buying and storing flavorings

Virtually all of us use herbs and spices in their conventional forms we find in retail food markets. You can always buy herbs dried, some of them fresh. Spices are available dried, whole or ground, rarely in the fresh form. Ginger is an exception. Chefs and professional cooks use flavorings for the same reasons home cooks do, but they rely more on fresh ones whenever possible. That is because maximum flavor impact, which is what the fresh version offers, is important to them and that is one notable reason why their food tastes so good. The fresh forms are also more readily available and fresher at wholesale than retail because there is more demand for them and they have high turnover rate. But if restaurant chefs use dry herbs, they make certain they don't keep them on their shelves for years as many home cooks do.

Another reason for tasty professional food is that chefs use herbs and spices far more generously than home cooks do. And they know how to use them. Today's diners prefer full flavor with plenty of impact, and being heavy-handed with flavorings helps. Remember this in your own kitchen. In many recipes you can safely increase, double, even triple the amount of herbs and spices called for.

But remember, too, that children taste food differently than you do. Children still have a large number of very sensitive taste buds. The flavor impact on those buds is more powerful than on ours, highly flavored foods easily overpower them. As we get older, we lose more and more of our taste buds, and highly seasoned foods become more acceptable. We may even seek out more intense flavors to titillate our remaining taste buds, something you need to know when cooking for older people. But use caution—even though older people have less taste buds, their tradition may favor mild, almost bland foods. You need to know your diners' tastes and background to season their foods for their pleasure.

Most of us buy fresh herbs mainly for special meals. But you don't really need fresh herbs and spices to get great-tasting food, dry seasonings are fine as long as they are not old and stale. Unfortunately, in many kitchens they have been on the shelf far too long to give much flavor. I am amazed to see spice containers in kitchens that should be in antique stores, though their content is still in use. Buy spices and herbs in small quantities, write the date on the container and replenish them with fresh ones when they get stale, usually within a couple of years of stored cool and dry.

Buy all your flavorings whole as much as possible. They keep fresh far longer for two reasons. They expose a much smaller surface area to the air when whole, slowing the staling process. But when you grind them fresh, you break the cell walls open, allowing the essential oils to

escape only when you need them.

A spice grinder is an essential kitchen tool for the serious cook. Two spice grinders are even better. A small one is handy for grinding just a little bit of something and an extra pepper grinder may serve this purpose well, though even a mortar and pestle will do. When you need more than a teaspoon of spice at a time, a spice mill or a small hand-held electric coffee mill works well. Reserve this for spices only, so you don't need to clean it every morning before making coffee. An efficient manual coffee grinder works just as well. But when you need lots of spices, as in Indian cooking, an electric grinder saves time and effort. When your recipe calls for several spices, you can grind them all together. To quickly clean your spice grinder, grind a small amount of bread in it and dump the bread out—the bread sponges up any leftover bits of spice.

Dry herbs are more concentrated than fresh ones. Remember the ratio of one-third teaspoon of the dry is equivalent to a whole teaspoon of fresh. If the dry herb is getting on in age, add a little extra to your dish, perhaps 25 to 50 percent more. If it is really aged and it smells like dry grass, don't add it at all, except to your trash can.

Freeze-dried herbs are the next best things to fresh herbs but few retail markets carry them, although restaurants use them regularly.

TASTINGS Dried and freeze-dried herbs

The quick, heatless action of freeze-drying obviously preserves much more of the volatile oil than the slow, heated drying process. SupHerb Farms, a California-based freeze-dried herb producer gives the following comparison:

Amount of preserved volatile oil

Herb	**Freeze-dried**	**Dried**
Basil	0.7%	0.4%
Cilantro	0.2%	Trace
Dill weed	0.7%	0.2%
Marjoram	1.7%	1.1%
Oregano	3.5%	2.8%
Parsley	0.6%	Trace
Rosemary	1.7%	1.1%
Sage	2.1%	1.7%
Tarragon	3.0%	0.6%
Thyme	1.7%	1.1%

According to the same company, freeze-dried herbs retain their volatile oil content for two to three times longer than dried herbs.

There is no good guide for the shelflife of spices and herbs. Their smell should be your indicator. Unground spices should keep for a couple of years, but ground spices and herbs lose much of their ability to add flavor within a year on the cupboard shelf. It is always best to store them in the coolest part of the kitchen in tightly-closed container. Shelves above or near the kitchen range (where you see them mostly) are the worst places. They tend to be the warmest and most humid part of the kitchen. Think of relocating them if that is where your supply is.

The McCormick Spice Company quotes the following storage recommendation for spices and herbs:

Whole spices	4 years
Ground spices	1 to 3 years
Whole seeds	3 to 4 years
Herbs	1 to 3 years
Extracts	4 years
Spice blends	1 to 2 years

Some spices are not easily available in any other but ground form, like paprika or chili. You can stash extra in your freezer and replenish the small container on the shelf from the frozen stock. Your supply will always be fresh.

Freezer storage is also useful for spice blends called for in ethnic cuisines. For example, if you cook Indian curries only occasionally, you will need a blend of spices called *garam masala* and a blend of curry. In an Indian kitchen the cook mixes up a few weeks' supply of both blends, and he or she uses them up before the flavors seriously dissipate. But if you make curry only once in six months, you either must mix a new small batch each time you decide to prepare Indian food or mix up a larger amount and keep it in your freezer, that tastes fresh each time you need it. Depending on your cooking repertoire, your freezer can hold several of these spice blends. They take very little space.

For best flavor, don't buy commercial spice blends but mix your own from fresh spices, using a recipe someone else has perfected.

Chili powder

You can control the pungency of this chili powder by the amount and type of ground chili you use. For a slightly pungent mix, use a mild chili, for a tear-jerker use hot chili. You can blend hot and mild ground chilies in the ratio that gives the acceptable fire level. To help you start, a proportion of ¾ part mild to ¼ part hot ground chili produces a medium-hot blend.

Make enough of this spice mix to store for future use in your freezer. For the very best chili powder mix, roast and grind your own dry chilies.

Ingredients

1 tablespoon cumin seeds
5 tablespoons ground chili (see note above)
1 tablespoon dry Mexican oregano
4 t (pure) garlic powder (not garlic salt)
½ teaspoon salt

Procedure

1. Toast cumin seeds in a small, heavy pan over medium to high heat while shaking often until fragrant, 3 to 4 minutes. Add ground chili and stir continuously for 1 minute. Remove the spices from the pan and let cool for a few minutes.

2. Grind the seeds and chili in a spice grinder (or a coffee grinder reserved for spices). Add the oregano, garlic powder and salt. Continue to grind for a few seconds until the mix is uniform.

Makes ½ cup chili powder. This keeps its flavor longest if you freeze it in an airtight

container, about 1½ years.

Note: To roast and grind your own chili, buy two dry New Mexico chili pods and two dry *pasilla* chili pods. Wash, dry and toast the pods on a baking sheet in a 350ºF (180°C) oven until just barely brown and fragrant, about 5 minutes. Let cool until you can handle them. Crack them open and shake out the seeds. Break them into small pieces and grind them in a spice grinder. Yields about 6 to 7 tablespoons medium-hot ground chili.

Curry powder

In the Asian curry belt every country, every region, even villages have their own characteristic curry powder mix. The variation of spices is infinite and to test and compare them all would take a lifetime. Here is a recipe with South Indian-Ceylonese flavor. You can vary the pungency by the type and amount of the ground chili. The only hard-to-find items are curry leaves and fenugreek. Most Asian food stores with Indian ingredients carry them. You can find fenugreek in a health food store with a good spice department, even in a well-stocked supermarket. Curry leaves are more difficult to locate but substitute bay leaves if all fails, using 1 bay leaf to replace 10 curry leaves.

Ingredients

3 tablespoons coriander seeds
4 tablespoons cumin seeds
2 tablespoons fennel seeds
¼ teaspoon fenugreek seeds
1 tablespoon black peppercorn
1 tablespoon black mustard seeds
½ teaspoon cardamom seeds
1/3 teaspoon whole cloves
2 teaspoons ground cinnamon or 3-inch (8-cm) piece cinnamon stick, broken up
20 dried curry leaves
1 tablespoon ground chili (mild, medium or hot, see note under chili powder recipe)

Procedure

1. Heat a small, heavy sauté pan on medium to high heat and add the seven seeds, cloves, cinnamon stick and the curry leaves. Toast them 7 to 10 minutes while shaking the pan often until they start crackling and give off a fragrant aroma. Add the ground chili and stir continuously for 1 minute. Remove the spices from the pan and let cool.

2. Grind the mixture in a spice grinder or coffee grinder reserved for spices.

Makes ¾ cup curry powder. Store in freezer for longest shelflife.

Chinese five-spice powder

Two ingredients of Chinese five-spice mix are not readily available outside Oriental markets: star anise and Szechwan pepper. The flavor of star anise is very similar to our own anise. Szechwan pepper is more aromatic than our black pepper and has a milder flavor. It is not even in the same family as black pepper. But the difference between the authentic and this versions is minor, and chances are no one but a true Chinese epicure can tell the difference. Don't be too

concerned about being authentic. Your goal is to create a flavor with minimal effort that is to your liking.

Five is a symbolic number in Chinese and has a magical power in herbal health medicine. That may be the reason for "five-spice," even though some Oriental cookbooks include six or seven spices in this spice blend. Here is a good five-spice mix.

Ingredients

12 star anise, or 4 teaspoons anise seeds
2 teaspoons fennel seeds
2 teaspoons ground cinnamon or 3-inch (8-cm) cinnamon stick, broken up
2 teaspoons whole cloves
2 teaspoons whole Szechwan pepper or black peppercorn

Procedure

Place all spices in a spice mill and grind until fine. Store extra in the freezer. Makes 3 tablespoons five-spice powder mix.

You can freeze your often-used herb supply, too. The easiest way to freeze herbs at home is to wash them, put them in a plastic bag as is, squeeze as much air out of the bag as you can, then seal, label and freeze. The volatiles escape very slowly, and you have fresh herbs for many months. You can also chop the herb, mix it with enough water just to cover, then freeze it in small batches in an ice cube tray. Once frozen solid, take out the cubes and store them in a labeled plastic bag in your freezer. You seal the volatiles in the frozen cube so these herbs keep fresh for years. This method takes up more freezer space, but you have a longer-term supply. Don't forget to label how much herb is in each ice cube so you don't have to measure the soggy stuff when you defrost it. Stored this way, herbs are only suitable for liquidy dishes, such as soups and stews.

You can also preserve chopped herbs in a little oil in your freezer. The oil seals in the volatiles and this method takes much less freezer space. I could not detect any difference in flavor between the three methods when I tested fresh herbs after a month of freezer storage.

Using flavorings

With the understand of how flavorings modify your food, you are now in a position to get their maximum impact.

The smell of cooking aroma in every corner of your house is a most enticing aroma. But it means that flavor compounds, that should have stayed in the pot, escaped all over the house. The trick to flavorful cooking is to keep those aromatic compounds in the pot where they belong with only the tiniest trickle escaping to whet appetites. If you add spices and herbs early in a long cooking process, much of the volatile essential oils find their way into the air, escaping with the hot steam. It is better to add them in the last quarter of the cooking period. This is also true for garlic. Onion is an exception that needs sautéing or a slight browning before it releases the maximum flavor through browning and caramelization. Too little time for the flavorings in the cooking pot is also unwise. The plant cells must have enough time to break down in the heat and release and activate the volatile oils.

Flavor extracts (like almond extract) and essential oils don't need heat activation, in fact if

you add them to very hot food, you allow too much of the oils evaporate. Add these to foods after cooking and to dish that cooled down some.

When adding whole dried herbs to your cooking pot, crush them first to start breaking down the cell walls. That helps to release the trapped aromatics that the heat in the pot completes. When you mix herbs into cold food, like in uncooked fruit sauces and fresh dips, soak the crushed herbs for a minute in a few teaspoons of boiling water, just enough to barely cover the herbs, drain, then add them to the food. The heat helps to release their full flavors.

Nearly all of the flavoring components of herbs and spices are in the essential oil part of the plant. The only notable exception is a popular herb, cilantro, also called coriander and Chinese parsley (not the coriander seeds but the leaf). Much of the flavoring in cilantro is water-soluble as opposed to other herbs with oil-soluble falvorings. It is particularly important in case of cilantro to add it very late to a dish, practically just before serving, to retain flavor. For the same reason cilantro doesn't retain much flavor either when you freeze it, or in dry form. It is one of the few herbs that you must use fresh or not at all. The only way I found preserved cilantro acceptable is in commercial freeze-dried form. Unfortunately, freeze-dried cilantro is not readily available in retail.

How much to add

Freeform flavoring your food with guessing and tasting is never the best way. Using exact measurements, then tasting and adjusting, is a much better, more reliable and more reproducible method.

Those great chefs you hear about who never use measuring spoons and cups to flavor don't have an innate ability to guess at the correct amount of a certain spice without measuring. Or your grandmother whose recipe uses a pinch of this and a handful of that. More than likely, their method of measuring simply doesn't include teaspoons and measuring cups. If you work with food all day, every day (like that great chef or your grandmother), your eye can gauge the exact amount of cumin the recipe needs, just like if they were using a measuring spoon. Until you get totally immersed in cooking like these professionals are, there's no shame of using standard measuring tools.

It is particularly important that you measure when you are preparing a larger quantity than you usually do, say 40 servings of a recipe. If you cook chili con carne for eight fairly regularly, you can spice it reasonably well by approximating the amount of chili and other flavorings. When you make it for 40, you need to multiply that same recipe by four. Ho do you multiply a "pinch of salt" by four? You will have no idea whether you should add one teaspoon, two teaspoons or 1½ tablespoons. If you have the exact amount written in the recipe for eight servings, then scaling it up or down eliminates the guess work, and your guests get the anticipated and expected wonderful dish every time without fail.

If you are unlucky enough to fall in love with a recipe that uses such indefinite terminology as a pinch and to taste, here are some hints of how to cope when flavoring a dish:

- Err on the side of too little flavorings. It is easy to add a little more—impossible to take it away if you start out being overgenerous.
- A pinch is roughly equivalent to 1/8 of a teaspoon.
- If it is salt, 1 teaspoon for eight servings is a good ratio for unflavored foods.
- When you determine the correct amount of flavoring with a standard measuring tool, write it on the recipe.
-

Essential oils

There are some useful culinary essential oils available in retail. Any health food store carries a large selection of essential oil for aromatherapy, some labeled suitable as culinary flavorings. But they are not easy to use and that is why they have not gained much acceptance. They are so highly concentrated that what you need in a dish you measure by the drops, and it is too easy to ruin a recipe by adding too many drops. For example, the equivalent to one teaspoon of lemon extract is only one or two *drops* of essential oil of lemon. If you are overzealous and use four drops, your cookies will reek of lemon.

As another example, when I make a gallon (4 liters) of peppermint iced tea, after preparing the tea from regular black tea leaves, I dip a wooden skewer into the essential oil of peppermint and stir the tea with it. The amount of oil that clings to the skewer gives plenty of peppermint flavor to the iced tea. One drop in the same amount would overpower it.

Essential oils are expensive, but using two or three drops at a time, the tiny bottle lasts for decades, if not a lifetime. They have unlimited shelflife. (Most of these bottles come with droppers for easy use.)

The extracts on your kitchen shelf are really essential oils dissolved in an agent, often alcohol, to make measuring more practical. It is easy to measure one teaspoon of vanilla, much more difficult to measure two drops of essential vanilla oil. That is probably why you don't find essential oils in supermarket spice racks.

Points to Remember

- Spices are more concentrated in flavorings than herbs and are from hard-stemmed plants; herbs are parts of soft-stemmed aromatic plants.
- Buy dry spices and herbs fresh and in small quantities, label the date of purchase; discard any that is old or stale.
- Buy spices and herbs whole whenever possible and freshly grind or crush them .
- 1 teaspoon dry herb equals 3 teaspoons fresh herb.
- Have a supply of fresh herbs you often use in the freezer.
- Make all you own spice mixes and store them in the freezer.
- Add flavorings late in the cooking process to preserve the essential oils; add extracts only after food is cool.
- For flavor impact, be generous with herbs and spices.

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